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The Parker Gas Engine.

The engraving on this page represents this engine, which has been the subject of various improvements during the past two years, and which, in its completed form, is now being put upon the market by the Yonkers Manufacturing Company, of 16 Dey Street, New York City. While the principles involved in the operation of this engine are substantially the same as in other gas engines, it possesses several novel features of construction, some of which will be understood from the engraving and description.

The explosive mixture is gas and air, but the gas may be of any kind, as coal, water or oil-gas, and not necessarily the regular fixed gas. Both the gas and the air are admitted through poppet valves, which possess the merit of requiring little power to operate, and the further advantage of growing tight by use. These valves are driven by cams on a horizontal shaft, which makes one-half as many revolutions as the crank shaft; if required to maintain speed under the imposed load, a charge is admitted and exploded at each second revolution of the engine. When this is not required—as it is not, under ordinary circumstances—the small fly-ball governor shown operates to prevent the opening of the valve for admitting the gas until such time as required for the speed and load.

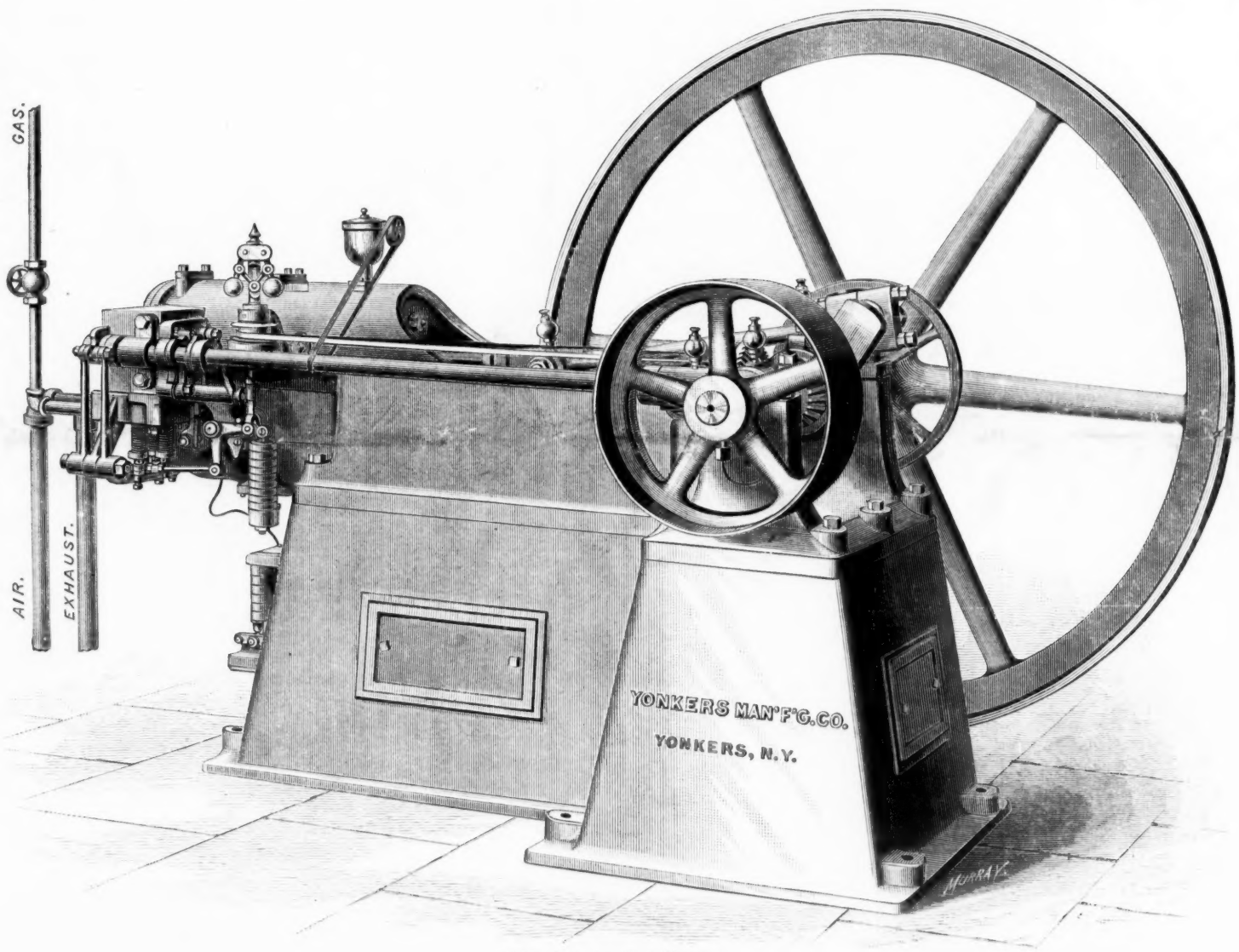
The explosion is not brought about in the cylinder proper, but in an extension at the side and end of it. The force of the explosion operates directly upon the piston, but a large portion of the resulting heat is absorbed and retained by the walls of the explosion chamber. This construction serves the double purpose of requiring less water to be circulated in the water jacket of the cylinder, and of keeping the explosion chamber hot, which prevents waste of heat. Below, but in one casting with the main cylinder, is an air pump, which operates to expel the products of combustion from the explosion chamber, so as to permit the next charge admitted to be free from impurities. This avoids clogging in the cylinder and the necessity of cleaning, and permits the use of any quality of gas, as previously referred to. The vacuum created by the air pump is effective in imparting power to the main piston when it is compressing the charge; this tends to an equalization of effect, and to more regular speed.

Instead of using the usual gas jet to explode the charges, electricity is employed. For this purpose a miniature dynamo, shown below the cylinder, is employed. This dynamo is driven from a pulley ring on the crank shaft, and the current generated is conducted into the explosion chamber, where, by simple mechanism, it is broken at the proper time, producing an intense spark about the size of a head of a pin in the center of the charge, making ignition positive. With this, no matches are required to be used in starting, nor smoke or smell occurs. This is considered by the manufacturer as a very important feature, as reducing the liability of fire from escaping gas, etc.

In starting, it is only necessary to give the fly-wheel a turn or two, which produces sufficient current to start the engine, when it will continue to run until the gas is turned off.

The cup shown at the top of cylinder is for oiling the piston. The belt shown drives a small shaft carrying a wheel, to which three or less loose arms are pivoted. These arms dip in the oil when at the bottom, and when at the top pass over a small funnel-shaped pipe into which the oil is stripped, and passes to the piston.

These engines appear to be thoroughly well constructed of the best materials, and with a design to secure durability and simplicity with little liability to derangement. They are manufactured for the company at the well known works of S. S. Hepworth & Co., Glenwood Station, Yonkers, N. Y., who, we are informed, will, if necessary to supply the demand, employ their extensive works to their full capacity upon them. Regular sizes are from two to ten horse-power, inclusive, but larger sizes will be made on special orders.



THE PARKER GAS ENGINE.

The Novelties Exhibition.

The Novelties Exhibition of the Franklin Institute, Philadelphia, will open September 15th, and close October 31st. The hall will be open for the reception of goods August 24th, and applications for space should be made to the "Committee on Exhibitions, Franklin Institute," as soon as possible. According to the "Official Bulletin" of the exhibition, inquiries and applications from intending exhibitors are growing from day to day. All applications for space must be made before September 12th, on printed blank forms which the committee will supply. Every exhibitor will be required to pay an entrance fee of $5, for which he receives a season ticket of admission. The charge for ten square feet of space is $200, with ten cents for each additional square foot. Power required to drive the machines will be furnished at 3 cents per horse-power per hour, the power to be rated at sixty square feet of belt per minute if the belt be single, and forty square feet per minute if the belt be double. If machines are driven by engines furnished by exhibitors, the indicator will be used to rate the horse-power. Exhibitors will be expected to have an attendant in charge of their exhibits from 10 A. M. to 10 P. M. daily, to explain to visitors the articles displayed. This exhibition will probably be the principal one of the year.

Locomotive Bearings.

We give the report of the committee on this subject presented at the Master Mechanics' Convention, substantially complete:

To the Officers and Members of the Committee of American Railway Master Mechanics' Association:

Your committee on "The Best Metals for Locomotive bearings" would report that they issued circulars requesting information on which to base their report. They have received ten answers to their inquiries.

In answer to the first question, "What has been your experience with metals used on engine and tender journal bearings?" Also on "Connecting rods and other parts of the locomotive?" they have the following replies:

Mr. Charles Blackwell (N. & W. R. R.)—"Unless care is experienced in the metal and pouring of bearing metal, very different results are obtained."

Mr. John Campbell (L. V. R. R.)—"Using all bronze metal bearings for locomotives except under engine truck, for four or five years. The engine truck bearing is a brass gib on top with babbitt on each side."

Mr. Jacob Johann (W., St. L. & P. R.R.)—"Soft metal bearings for engine and tender journals and babbitt strips in rod and driving box brasses, are economical and satisfactory in their operation."

Mr. William Woodcock (P. & R. R. R.)—"Journal bearings made of the best copper and tin in proper proportions with the most satisfactory results. Have used a soft metal that produced exceptional wear and mileage, but it could not be relied on under all circumstances, as in case of a hot journal, the metal of bearing would crush or break in pieces. Have had a number of these bearings run 90,000 miles on journals $3\frac{1}{2}''\times7''$ under passenger coaches and remain in service until completely worn out. Believe that if this metal were encased in a brass shell of proper strength to sustain the weight, it could be used with very good results and increase mileage over the use of brass alone."

Mr. George W. Stevens (L. S. & Ms. R. R.)—"Use engine and tender bearings and connecting rod bearings made from old metal. The composition is about one of tin to five of copper, and one of tin to seven of copper."

Mr. William Montgomery (P. & R. R. R.)—"Use brass with babbitt metal."

In answer to the second questions: "Have you used journals lined with lead, or any other soft metal? If so, with what results? Please give composition of metal other than lead. Also sketch showing shape and dimensions of bearing; number of square inches of bearing surface; weight carried on journal, and kind of lubricant used. Give weight of bearing when first put in, and loss of weight to each 1,000 miles run. Also length and diameter of journal, and loss in diameter from wear," they have the following replies:

Mr. Charles Blackwell—"Hard brass with babbitt gives very excellent results."

Mr. John Campbell—"Have used lead-lined bearings with good results."

Mr. J. S. Graham (L. S. & M. S. R. R.)—"Have used lead-lined bearings with good results. Also with an alloy of lead 80 parts, tin 10 parts, antimony 10 parts, which is preferable to lead, not being pressed out of place as readily as lead and standing a higher degree of heat before melting.

Weight of brass	11 lbs. 6 oz.
Maximum weight on journal.	8,000 lbs.
Square inches of bearing surface	21
Lubricant "Galena engine oil"	
Loss of brass per 1,000 miles run	8.29 drachms
Loss of bearing (iron) per 1,000 miles run	.00059″ in dia.
Length of journal	7 inches
Diameter of journal	3.75 "

"This is from a test of oils recently made with solid Ajax metal journals not lined with soft metal, to insure that loss shall be from friction only instead of part soft metal pressing out."

Mr. Jacob Johann—"Use a half shell with babbitt bearings for both engine and tender bearings. The composition of the babbitt is, if the lead is soft, four parts of lead to one of antimony. If lead is hard, five parts of lead and one of antimony. For the shells, 9 of copper to 1 of tin. Engine truck journals are 5″ in diameter and 9″ long, with bearing surface of 54 square inches, with an average weight on each journal of 7,000 lbs. Tender truck journals $3\frac{1}{4}''$ in diameter and 7″ long, with an average weight on each journal of 8,000 lbs. Weight of engine truck shell is 17 lbs., weighing with babbitt 24 lbs. (Method of construction shown in sketch.) Weight of tender truck shell is 6 lbs., weighing with babbitt 9 lbs."

Mr. William Woodcock—"Have used lead-lined journals with satisfactory results, especially on worn journals; used them on the passenger coaches, the journals of which have been worn hollow by service. On worn axles the lead-lined bearing will adjust itself to the irregularities without fitting, which would be necessary with solid bearings. The standard bearings for passenger coaches and tender trucks will weigh $8\frac{1}{2}$ lbs. The metal is 6 lbs. of copper to 1 lb. of tin. Will average 40,000 miles with a loss of $\frac{39}{1000}$ lbs. per 1,000 miles run. For driving shaft bearings use the same metal as above without babbitt. We recently took out a set of six boxes from a ten-wheel engine in freight service. Weight on drivers, 68,000 lbs.; journals, $6\frac{1}{2}''\times28''$; cast-iron box; composition of bearings, 5 of copper to 1 of tin; mileage, 116,869 miles; average wear of brasses, $\frac{5}{32}$ of an inch; exceeding 46,000 miles to $\frac{1}{16}$ of an inch. On heavy passenger engines the wear of brasses would average about 8,000 miles per $\frac{1}{16}$ inch."

Mr. Geo. W. Stevens—"Have used lead-lined bearings with good results; also with an alloy of 80 parts of lead, 10 parts of tin and 10 parts of antimony. Lubricant used, black oil; bearings weighed when put in, $11\frac{1}{2}$ lbs.; average weight lost for each 1,000 miles run, about 1 ounce; journals, $3\frac{3}{4}''\times7''$. No perceptible loss in diameter by wear."

Mr. W. L. Brokaw (W., St. L. & P. R R.)—"Use babbitt in about everything. Allow the babbitt to project about $\frac{1}{16}''$, so it will wear down to bearing."

Mr. F. G. Bromwell (I., B. & L. R. R.)—"Prefer the common brass bearings with thin lead lining."

In answer to the third question, "Have you knowledge of any composition that answers the same purpose as babbitt metal in connecting rods, etc., that requires a higher degree of heat to melt from friction than babbitt? If so, please give composition," they have the following replies:

Mr. Charles Blackwell—"Do not use babbitt in connecting rods."

Mr. J. S. Graham—"I do not know the degree of heat required to melt babbitt metal, but from the original formula (tin, 96; antimony, 8, and copper, 4) I should suppose any of the babbitt metals (so-called) in use now-a-days would not be inferior in non-melting qualities."

Mr. Jacob Johann—"Have not used other metal than brass and babbitt for connecting rods, except a steel bushing, with which the result was disastrous. Do not think that babbitt can be satisfactorily substituted by a metal that will require a higher degree of heat to melt from friction without using a higher grade of lubricant, and a more costly one than now in general use. If phosphor bronze is, as claimed, a partial lubricant, it might prove to be a good substitute; have never tried it."

In answer to the fourth question, "What kind of metal, in your experience, has given the best result for driving shaft, engine and tender journal bearings? If an alloy, please give composition, dimension and shape of same; also method of fitting bearing in a cast-iron box," they have the following replies:

Mr. John Campbell—"Use bronze metal bearings for driving boxes."

Mr. J. S. Graham—"Have known an alloy of 85 of copper and 15 of tin to give good results, and without a competitive test know of none better. Use, in tender truck journals and driving boxes, gibs, filling in on sides with an alloy of 5 of zinc to 1 of tin. Am not sure of the anti-friction qualities of this alloy as compared with other metals, but it requires a higher degree of heat to melt it, and it seems to answer in other respects."

Mr. Jacob Johann—"Use for driving boxes 6 parts of copper to 1 of tin."

Mr. William Montgomery—"Prefer good, tough brass for driving and truck boxes. Composition, 2 parts tin, 10 copper and 1 zinc."

In answer to the fifth question, "Have you found the inserting of babbitt metal in journals an advantage; if so, to what extent? Please explain method of inserting"—they have the following replies:

Mr. Charles Blackwell—"Experiments give contradictory results."

Mr. John Campbell—"Use a brass gib on top and babbitt on both sides."

Mr. J. S. Graham—"Have found insertion of babbitt metal useful."

Mr. Jacob Johann—"Have found the insertion of babbitt metal in journal bearings to be beneficial. They get a bearing quicker, with less liability to heat, and have a less wearing effect on the journal."

Mr. W. U. Brokaw—"Use a composition of $4\frac{1}{2}$ to 5 parts of lead, to 1 of antimony."

Mr. Wm. Montgomery—"Believe the use of babbitt to be an advantage."

In answer to the 6th question "What metal have you found to give the best results for connecting and parallel rod bearings; what advantage, if any, is there in solid bushing instead of the square bearing fitted in straps? Is babbitt a benefit, or otherwise, in connecting-rods, and how should it be inserted?" they have the following replies:

Mr. Charles Blackwell—"Hard brass gives the best results. Solid bushing preferred, if sufficient pin dimensions are admissible. Simplicity and freedom from tampering with by engine-men are their chief advantages."

Mr. John Campbell—"Bronze metal bearings for connecting and parallel rods with the best results. Do not consider babbitt a benefit. Do not use solid bushings. All square bearings fitted in strap."

Mr. J. S. Graham: "Have known good results from an alloy with a zinc basis; one not easy to melt; zinc four or five to one of tin. Prefer tin, but have used with success tin 6, antimony and copper 2 oz. The apparent advantage of solid bushings in parallel rods is, less fitted parts, therefore less labor and expense in construction. Less number of parts subject to breakage, wearing parts the bushing only, therefore more easily, cheaply and quickly repaired than when bolts, keys and straps require renewal. Also insurance against being thrown out of adjusting by careless keying."

Mr. Jacob Johann—"For connecting and parallel rod bearings, use a babbitted brass. For rod brass, the composition is 7 parts of copper to 1 of tin. Believe that babbitted boxes for the purpose in question have proved the most satisfactory, both as to economy and practical application."

Mr. William Woodcock—"In connecting and parallel rods use all strap rods, square bearings, with good results. Use babbitt metal in all rod bearings of brass, except at front end of connecting-rod at crosshead. The metal is inserted in diagonal strips $\frac{1}{2}''$ wide. Have used phosphor-bronze in rods with good results. With this metal no babbitt is used. The parallel rod brasses frequently run 90,000 miles without being taken down to close up. The straps should be keyed solidly together, and let alone. These statements refer to passenger engines running 150 miles per day."

Mr. Geo. W. Stevens—"The advantages of bushing parallel rods are, less fitting of parts; less expense; less parts subject to breakage; less cost of renewal. Have found babbitt a benefit in main and connecting-rod bearings."

Your committee regret that more information was not received. The subject is an important, and at the same time a difficult one, to determine what is "the best metal for locomotive bearing." The conditions of service are ever changing. The questions of speed, weight, proportions of parts, rigidity or flexibility of same, lubricant and condition of track, are all important factors to be taken into consideration.

Your committee will recommend that the members of the Association give this matter special attention, and make careful experiments to ascertain which of the different metals and alloys gives the best results as to wear of bearings. Also the journals to which they are applied, and to the quality and quantity of the lubricant to produce the best results. Also to determine whether or not the advantages claimed for lead-lined bearings in freedom from heating and fitting badly-worn journals, is not offset by the more rapid wear of the journal, reducing it in a short time to unsafe diameter.

The question of solid bushings in the ends of connecting-rods is also one that should be more closely entered into. The plan for reduced cost of making and keeping in repair over the old style of rods and straps and keys, has not been demonstrated by figures obtained from actual results. If it has been, your committee have not been able to obtain such figures.

JAMES BROWN,
J. S. GRAHAM, } Committee.
J. P. HARVEY,

DISCUSSION.

Mr. Setchel—Mr. James Meehan is present, and I believe he uses solid brasses in his rod to a greater extent, perhaps, than anyone present—using them in the front end of the rod, even. I would like to hear from him in regard to the matter.

Mr. Meehan (Cincinnati Southern Railroad)—I am unaccustomed to talking in public, but I will tell you what I know about the matter. We have eight passenger engines, with solid rods at the back end of the main rod and side rod. They have been in service about two years, and have given us no trouble. Engine No. 182 has made 110,000 miles, and has never had a rod down. She is now in the shop for the purpose of turning her driving wheels, and when she goes out the rods are to be put on again in the same condition, not having been touched. The others we did not have quite as good results from. It only takes about three hours to renew them. We press them in at twenty tons. I think the solid rod is much the cheapest, though I am not prepared to recommend them on the back end of the engine. For side rods I would have nothing else.

Mr. Blackwell—On the Norfolk & Western & Shenandoah Valley road we had about forty engines equipped with solid-bushed side-rods. They have given us very excellent results, but I would not recommend bushes being used of this character, unless sufficient pin dimensions are given. If an ordinary pin is used, a solid bush is sure to give trouble, as it has not sufficient surface to insure length of service. When you have sufficient bearing surface it works extremely well.

Mr. McCrum—I would state in this connection that I have between forty and fifty locomotives equipped with solid bushing, extending over five or six years. My practice and experience have been entirely satisfactory, much more so than with the use of adjustable plugs. I had two or three different forms of fitting, but as I have nothing to illustrate with, that is all I have to say on the subject.

Mr. Blackwell—The smallest dimensions of pins that I like to use solid bush with are four and a-half inches diameter and four lengths. I have used different metals for bushes, but I prefer good, hard brass, I have used phosphor-bronze, and I find that, although it runs cool, it becomes loose more easily than hard brass.

Mr. Sprague—I would like to ask what the experience of numbers is, who are babbitting rod brasses—whether they cast the rests for the babbitt or drill them? I think it is best to drill them. You can drill them cheaper, and you are free from any scale or dirt in your babbitt. I have often found that when the rests were not thoroughly cleaned, that there would be a little sand in the journal.

Mr. Blackwell—If Mr. Shaver, of the Pennsylvania road, is here, he might be able to give us his experience with solid bushes.

Mr. Shaver—We have one powerful engine that uses solid bushes in her side bars, and she works very satisfactorily.

Against Sunday Work.

BY JAMES F. HOBART.

No more Sunday work for us. We have said it, and we mean to stick to it; but how to keep the shop running without it is the problem.

Here we have a big plant of steam and water power, hundreds of feet of shafting, hundreds of bearings, two or three miles of steam pipes, and a thousand little things which are always needing a "stitch in time."

We have got to keep the above plant in repair, be responsible for all that is done by our men, keep everything moving as much of the time as possible, and keep the owner good-natured and satisfied.

Our plant is about like the one described last week, where everything is connected with one big shaft, and all must run or all must stop.

There are just two ways in which to tackle this problem. We have tried both, and where one will not work, the other never fails. We always worked for the interest of our employer, although sometimes we could not convince him that our views were correct until we had proved them, and got him cornered in a hole so close that he could not crawl out anywhere.

The hardest job of this kind which we ever undertook was, to convince the owner of the above-described big plant that we could keep his mill running in good shape and not work Sundays. We managed to convince him of it, and then it took all our ingenuity to live up to it. If this, the first method, had failed, we should have told Mr. Owner that "work Sunday we won't," and then have stuck to it.

This never fails to cure our side of the question, but it never helps the owner's side. Owner gets a little mad because we "left," and our successor has his hands full of Sunday business.

We want to figure it out fine enough to drive into owner's head, before he knows it, that Sunday work don't pay. We stopped working Sunday, but Sunday work did not stop by any means; and owners have got to be educated up to this matter, just as some of them have yet to be convinced that $1.25 steam engineers don't pay any man.

If our plant had been arranged on the independent plan, and each machine connected direct to steam or water, then our path would have been clear. We could have shut down that particular machine, water-wheel

or engine, and repaired it as we pleased, but our big water-wheels started up at one o'clock Monday morning, and ran until 11:30 Saturday night, excepting one-half hour night and morning, when the mill shut down for the oiler to have his innings.

Suppose something got lame about the water-wheel gate and you wanted to stop two hours to fix it. Now, it takes a "powerful lot of gall" to walk into the office and tell owner that you want to stop his whole mill two hours rather than come down on Sunday. Here is where the shoe pinches, and here is where the all-connected power business is a nuisance. They generally both go together, and both should be discouraged by engineers.

The man who is running a day plant has no business doing repairs on Sunday, and there is not a shadow of an excuse for him, unless it is "the owner." Repairs that *must* be done could be attended to of an evening, if necessary; but night work is almost as bad as the Sunday job itself, and we wish no part of that, or Sunday work either.

Why can't some of our "Practical Men" tell us how they got over the question of "working Sunday," or "getting owner mad" by refusing to. *Sunday work must go!* and how quick it goes all depends upon readers of the AMERICAN MACHINIST. Just imagine its thousands of readers all turning out Sunday morning and saying, "No Sunday work for us." What a change there would be in the ways of doing repairs; and I, for one, would like to hear how the boys got some of the ugly jobs done without working Sundays.

This matter is entirely in the hands of the machinists of America. Let them act, and they will abolish a slavery that is a curse to the working man. If you will only say *no*, and then *stick to it*, it will not take long to solve this Sunday problem.

About every piece of machinery in the United States will change hands during the next fifty years. Some poor chap who is grubbing away in a wheel pit or engine room, is to be the agent or superintendent of that big manufacturing concern, and it will lay with him to say whether his men shall work Sunday or not. Many of our future "owners" are now plodding along with a cold chisel, bobbin, or plane in their hands, and if they will look into the matter and decide to say "No Sunday work for us," there will be no one to dispute their say when they come into power.

The only way to get rid of Sunday work is to educate ourselves out of it. There is hardly a manufacturing concern in the country but requires their mechanics to be on duty Sunday for repairs. Sunday work, we are sorry to say, is much more common now than it was twenty years ago, and if some move is not made by our mechanics, they will soon be required to work seven days in every week as a matter of course.

We once worked in a machine shop which derived its power from a large water-power company. Every Sunday the water would be shut out of the canal, and boss would be at his wits' end in order to get repair jobs done for his neighbors. It did not take him long to take in the situation. He bought a little one horse-power steam engine, took steam from the circulation, and belted direct from engine to countershaft of the lathe. There was no chance after that to get out of a Sunday job. He had the business figured down fine, and every Sunday we would have a picnic among the boring machines, shapers, and other machines.

To come right down to the question: How are we to fix a leaky safety valve, or take up our engine belt, without doing it Sunday? That is where brains are needed, and, as before stated, the remedy must be applied in the engineer's or architect's office. Things must be planned in such a manner as to allow necessary repairs to be made with, at least, half decent comfort and for the least money.

Many of the "boys" cannot afford to take the stand we have taken and say "we *will not* work on Sunday;" so they are obliged to do the next best thing and use their wits to work things around so as to dispense with *most* of the Sunday work.

We do not believe there is a single shop in the United States in which the greater part of Sunday work might not be eliminated by the persistent use of a little common sense and diplomacy, and if *all* of our mechanics would take hold of the question and act in unison, then we could all afford to say "no." We could tear out Sunday work root and branch; get a chance to look clean and decent one day in the week, and to rest up from six days of the hardest work that ever falls to the lot of the mechanic.

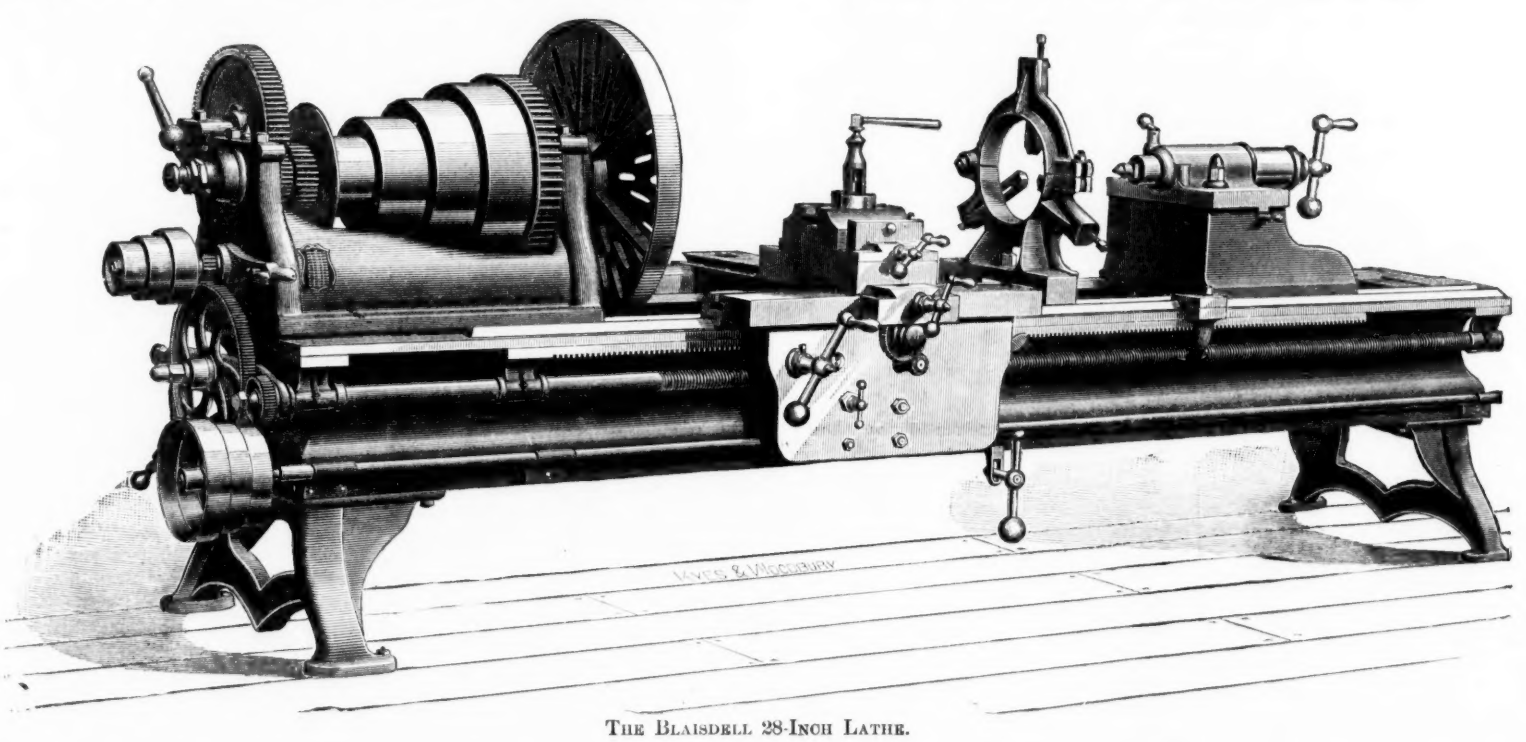
The very worst in the whole lot is the owner, who wants everyday repair jobs, and even new work, done on Sunday. Such people are a disgrace to themselves and to those whom they represent. A mechanic who works for them will lose all the self-respect he ever had. He will be little better than a cart horse or a pack mule, but still he is better than the man who insists on having the work done.

How Not to Mine Silver.

A correspondent in the silver mining region writes us: "The silver-producing section has for twenty years past been the field of operations for a class of Eastern adventurers, who, by their wily schemes, have done much to prejudice the East against silver. One of their many jobs is worked about as follows: They purchase some worked-out mine for a nominal sum and start a small mill, and place the stock in the New York market. Sales start at a low figure, and under the incentive of small dividends (paid from out of their pockets), and larger ones as soon as the mammoth reduction works are completed, the stock reaches a large price, and the swindlers unload; then comes the collapse, and a host of swindled people are ready to believe anything bad about silver. Again, some well-meaning capitalists form a syndicate for mining in a legitimate manner, and send some young college graduate out to superintend operations, who don't know a drift from a cross-cut, and whose only recommendations are a portion of the alphabet appended to his name. This gentleman generally erects a mill the first thing, not particularly because the mine justifies it, but 'every one needs a mill, you know.' Plenty of ore in sight, must have the mill ready when we begin extracting it, and so on to the end of the chapter, and about the only extracting this young gentleman does is from the pockets of the stockholders. He soon works out his bonanza, and leaves a large monument of his folly behind. When men have lost money in silver mining either through avarice or inexperience, they are apt to be slightly prejudiced, and to do all in their power to misrepresent legitimate mining to the general public."

The Blaisdell Improved 28-Inch Lathe.

The engraving on this page shows a 28-inch swing engine lathe, built by P. Blaisdell & Co., Worcester, Mass., from an improved pattern. The spindle has been made heavier, and the cones and gears have been enlarged. The front bearing has been increased from $2\frac{7}{8}''$ to $3\frac{5}{8}''$, and the dead spindle has been enlarged from $2\frac{3}{8}''$ to $2\frac{7}{8}''$ diameter. The face gear is $17\frac{1}{2}''$, and the cone 16″ diameter. The lathe is geared $12\frac{3}{4}$ to 1. The spindle is made heavy enough to put a $2\frac{1}{8}''$ hole through it if desired. In some instances this has been done. The cone carries a four-inch belt. The carriage, which is fitted with cross feed, has very long bearings on the V's; Slate's taper attachment is applied, if desired. The feed is carried by a rod with as near a positive friction as is possible, thereby leaving the screw free for screw cutting. Lathes of this pattern are made with beds ten to twenty feet long, weighing from 5,100 to 6,850 lbs. As will be seen by the engraving, the machine is well proportioned and adapted to general machine shop work.



THE BLAISDELL 28-INCH LATHE.

A Swedish engineer has succeeded in producing a new explosive, which he calls romite. It is claimed that no elaborate machinery is required in the manufacture of this explosive, that it will not freeze, and cannot be exploded except by ignition. Experiments have been made with the new explosive for blasting, and it has also been tried in shells, the results, it is said, in both cases being highly satisfactory.

Test of Elevated Road Locomotive.

Angus Sinclair, of the *National Car Builder*, recently made some tests on the Third Avenue Elevated Road, with a view to determine some of the elements in the cost of locomotive service on that road, which are published in the journal named. The engine he experimented with was of the usual Forney type, weighing, in working order, $21\frac{1}{2}$ tons, and having cylinders 11″x16″. Mr. Sinclair started out with the impression that the power required to run trains on the elevated roads was very generally underestimated, and his experiments seem to demonstrate the correctness of his views in this respect. Why so much more power is required than is usually estimated is very clearly shown by Mr. Sinclair to be in the fact that during the run of $8\frac{1}{2}$ miles there are 25 stops, making the run in 42 minutes. The power, then, is expended in getting the train up to maximum speed these 25 times. If the run was made without stopping, he concludes it would be done with a drawbar tension of from eight to ten pounds per train ton, but under actual conditions the tension is about forty pounds per train ton while the engine is using steam.

The train which Mr. Sinclair experimented with consisted of four cars, and the total train and engine weight was about 80 tons. From indicator diagrams taken, the mean effective pressure (average) was 81.5 lbs., giving a total tractive force of 3,759 lbs. From this he deducts 10 per cent. for friction, which leaves a little more than 42 lbs. per ton for moving engine and train.

The average power developed was 163.4 indicated horse-power, and the engine used steam for 20 minutes of the 42; so the average power for the 42 minutes was 77.8 horse-power.

He concludes that—"To move trains by continuous power, such as rope traction or electricity, would require the transmission from the power station of at least 77.8 horse-power for every train in motion. During commission hours, at present, there are sixty-three trains in motion on the Third Avenue line. This would require 4901.4 horse-power."

He found that the boilers evaporated 7.4 lbs. of water per pound of coal, making no allowance for water entrained, nor for loss in cleaning fires and waiting for trains. This gave an indicated horse-power on a consumption of 5.8 lbs. of coal per hour, the conditions of running, of course, being unfavorable to high economy.

To copper iron or steel, first make the article clean and bright by filing or by using a scratch brush, tumbling, or any other method. Apply to the surface a coating of cream of tartar, then wet the surface with a saturated solution of sulphate of copper, and rub with a hard brush.

On the Warping and Cracking of Castings.

BY T. H. RADCLIFF.

When a casting comes out of the sand in a different shape from what the pattern was in, in the mould, it is caused by unequal contraction, some parts of it having cooled faster than others. This is usually caused by some portions of it being heavier than the rest. After the light parts are cold and done shrinking, the heavy parts are still hot, having yet to shrink, and in doing so draw the light part with them. When the casting is of such design that it cannot bend, then it breaks, or cracks.

In Figs. 1 and 2 are shown a section and top view of a truck wheel—what is known as a soft wheel. In trying to chill the rim it was found that the arms would crack every time. This was caused by the rim cooling first and the hub last, leaving a strain upon the arm. Digging out the core and cooling the hub with water did not change the result; so the following plan was tried with success: A chill was made to suit each end of the hub, and the wheel cast with them on, as shown in Fig. 1. This had the desired effect, for none of them have cracked that were cast in this way. It is a case where the same amount of iron was in the hub each time and shows the good effects of cooling. The chills do not come over the ends of the hubs, so it does not interfere with their being faced off. Here there is no chance for the arm to bend, so it cracks, and is a small illustration of the great strain castings are sometimes subjected to. For, calling the sectional area of the arm two inches, and the breaking strain of cast iron 31,829 lbs. per square inch, we have 63,658 lbs. exerted in pulling the arms apart. What applies to the above wheel applies also to pulleys. If the arms of a pulley crack, the rim has cooled first and the hub last, leaving the arms in tension or the rim in compression. The old style of curved arm was intended to remedy this, but it only partially did so. If the rim cracks, which is not so often the case, the hub has cooled first and the rim last, which leaves the arms in compression and the rim in tension. This is shown to be the case in the fly wheel, where, if the rim is not cooled the arms have a tendency to buckle or get dishing. In pulleys that are of such a design that the arms have a tendency to crack, they may be benefited by chambering out the hub; that is, making the core larger in diameter for a short distance in the center, which makes the hub lighter, digging out the core as soon as cast, and also gating in two opposite places on the rim, which keeps the hot iron in the rim and allows the cooler iron to run to the hub.

In casting the counter weight with a $2\frac{1}{2}''$ hole through it, as shown in Fig. 3, there is often trouble in keeping the core straight, so much so that in the first two that were cast the sustaining bolt, 2″ in diam., had to be heated red hot and driven in to accommodate itself to the curved hole, this was caused by the core prints on the top and bottom holding the core and $\frac{5}{8}''$ core rods firmly, so that it could not expand up or down, and it therefore bent sideways, to make up for its increased length. To remedy this the core print was continued through the cope, and made large enough to be a loose fit. Some pieces of cloth 8″ wide were given a coat of paste and wrapped around the top end of the core, making $\frac{1}{8}''$ thickness on each side, when it was blacked over and dried. This projected into the casting 4″ where the iron is liquid for some time and up into the core print 4″ where the iron sets almost as soon as the mould is full; the pasted cloth burns away and leaves a space of $\frac{1}{8}''$ on each side, which acts as a stuffing box, and allows the core to expand upwards freely.

In an air chamber, kettle, or any brick core that acts as a rounding or spherical top where the iron runs over it, there is often trouble caused by the loam expanding, the part that is hot expanding or buckling over the parts that are cold. This, though it may not condemn, yet hurts the appearance o what might otherwise have been a nice looking casting. A good plan for this is to saw a groove over the top of the core $\frac{3}{16}''$ wide down to the brick so as to divide in quarters. Also another groove around the core to meet them the length of the radius down, measuring from the center on top. This leaves a space for the expanding loam to fill, and if not quite filled up it is easily chipped off. The loam for a core of this kind should be mixed as open and porous as possible, just so the iron will not cut it when pouring.

A tedious operation about a brick core is to cut out a row of bricks after the casting is poured, to allow it to contract. This trouble may be avoided by building in a shrinkage piece, as shown in Fig. 4. A chain is attached to it at the lower end by a clevis and bolt, the chain running under the opposite side of the bottom plate through an elbow to the top of the pit. Soon after the casting is poured, hook on to the chain with the crane and pull out the shrinkage piece, which leaves a space of 2″ wide for the casting to shrink on.

The most important item connected with this subject, is the iron, what is known as the regular mix in a foundry. If this is not right, nothing will be right. Whole heats of pulleys have been spoiled by a slight change in the mixture. The regular mix should have, besides the other properties required, that of a minimum of shrinkage. This is best accomplished by using three or four brands of iron. When a new lot comes in use, say, one-sixth of it for one heat, cast some test bars 4 feet long by 1″ square; compare these with a known good quality as to shrinkage, when more or less of it can be used accordingly.

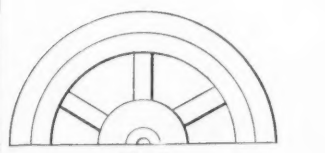


Fig.2

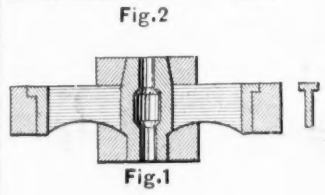


Fig.1

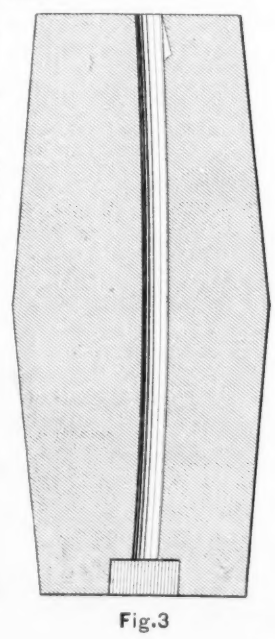


Fig.3

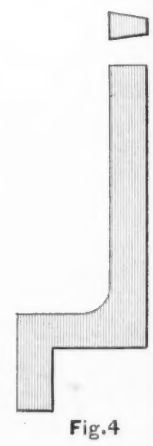


Fig.4

Looking for Improved Locomotives.

The committee on new plans for the construction and improvement of the locomotive reported at the recent Master Mechanics' Convention that not much improvement had been made during the past year, judging from the replies received to their circular soliciting information, or else the members were too modest to mention the facts. They say: "We believe the continued depression in business on our railroads forbids any radical changes in the construction of the locomotive at present. A number of new plans or theories of new construction have been brought out during the last two or three years but they have failed to produce the desired results or warrant their adoption. The tendency among our master mechanics now, is to so construct the locomotive as to reduce the cost of repairs, and to secure greater efficiency of service by the use of good material and workmanship, and exercising proper care of the same while in service." The committee embodied in its report some drawings of new locomotive boilers and attachments, including plans of a new engine proposed by M. N. Forney, the Decapod locomotive, a ten-wheeled locomotive built by the L. V. Railroad, a patent crown sheet, a style of lagging boilers on the Lake Shore road, an improved crosshead and guide by F. W. Dean, and a new boiler by John Campbell.

The method of lagging locomotive boilers furnished by Geo. W. Stevens, superintendent of motive power of the Lake Shore road is by placing a sheet of asbestos one-quarter of an inch thick on the boiler. On top of this is placed hair felt one inch thick, over which is placed planished iron. No data as to durability and economy as compared with common forms of lagging were furnished. The committee was of the opinion that a more durable lagging or covering for locomotive boilers is desirable also as a matter of economy, as wood lagging put on in the usual manner becomes charred or burned, and is also liable to take fire from sparks and cause trouble. A number of master mechanics are giving this matter their attention by testing several kinds of boiler covering.

J. Davis Barnett, mechanical superintendent of the Grand Trunk Railway, of Canada, expects to conduct some experiments with a compound locomotive recently brought out on their road, it having a high and low pressure cylinder on each side of engine, the distribution of steam being effected by one balanced slide valve working between the two valve faces, with the result of not complicating or adding any more parts to the present gear. Mr. Barnett says this arrangement possesses some advantages over the other systems of compound locomotives now in operation. "The results of same," say the committee, "will be anticipated and awaited with much interest by the mechanical world."

The committee was composed of Wm. Woodcock, Central Railroad of New Jersey; G. W. Stevens, Lake Shore & M. S. Railroad; and A. W. Sullivan, Indiana Central Railroad. Their report was received.

DISCUSSION.

Mr. Stevens (Lake Shore Railroad)—If I understood the reading of the report correctly, that was the method of lagging on the Lake Shore Road. Now, that method of lagging only applied to the lagging of such portions of the boilers as have heretofore been uncovered. I know it is not the general practice to lag the boiler head. We want to lag the outside of the fire-box.

Mr. Setchel (Ohio & Mississippi Railroad)—It does not include that part usually covered by the wood?

Mr. Stevens—No, sir.

Mr. Woodcock (Central Railroad of New Jersey)—The committee was at a loss to know exactly in reference to that matter, but as some members had heretofore tested the asbestos, thought it might be included in the same, as I have no doubt we are all trying to secure something more durable than wood, and asbestos seemed something in the right direction. We included this to the best of our knowledge. Of course, if we can lag all the exposed parts of a boiler, I suppose it would be a gain, but it is not usual to do so, and it is interesting to the members to know that it can be done, as has been explained by the prints. I would suggest that the report be corrected or explained in that manner.

Mr. Stevens—The blue prints show quite clearly just how the lagging is applied. It is substantially as described in the report, that is, first a layer of asbestos, and then a layer of felt, and then a covering of iron.

Mr. Swanston (J. M. & I. Railroad): There was an idea presented in that report about raising the side sheets above the level of the crown and riveting the crown to rest upon them. That leaves a hollow space, where mud gets in. We have constructed several engines like that, and I would like to know whether members of the convention have side sheets raised in that way.

Mr. Campbell (L. V. Railroad): I have made them in the last twelve years by running the crown sheet one inch above the side sheet. We have had defects in the old way.

Mr. Sinclair—While this subject is up, I see the compound engine case spoken of in it. In order to make better use of the steam in the cylinders, there are a great many of the more advanced master mechanics and mechanical engineers looking towards the compounding of the locomotive, so that better results will be produced. I think it is probable, by employing a better valve gear, that the same results as are obtained from compounding may be brought directly through the ordinary cylinders of the locomotive. There is a steamer running out of New York, whose construction seems to me very interesting to those who are paying attention to this subject. The steamer Hudson, belonging to the Cromwell line, has a single cylinder, with an adaptation of a valve gear to it, which gear is such that the cut-off can be made very early, and steam held close to the end of the stroke. With that engine they have obtained almost as good results as anything got from the compound engine. It is necessarily much simpler than the compound engine, and that is a point of great importance to locomotives; consequently, I think it is desirable to work in that direction. When we are increasing the steam pressure continually, it seems to be very necessary that a gear should be employed that will take more out of the steam than the link gear. I think for comparatively low pressure there is nothing equal to the link, and its simplicity is a great recommendation to every one in charge of machinery; still, for very high pressures, it is not at all a perfect gear, and I think if you can get a gear that will cut off, say, at three inches, and expand down much nearer the atmosphere than the link can do, that you will obtain approximate results to what is got with the best compounded locomotive. Some of those drawings around on the wall show that gear of Mr. Strong's, which Mr. Mitchell, of the Lehigh Valley road, has recently applied to an engine, and, although the indicator cards there do not show a very early cut off, yet there is the possibility of obtaining that by the gear in question, and consequently I think that is the proper line of improvement for American master mechanics to follow. That subject will force itself upon the whole of you sooner or later, and the sooner you begin to study out the question, and make yourselves familiar with it, the better I think it will be for all interests. I merely make this suggestion as a possible line of improvement in reference to the compound engine. There are very few who look with favor to the compound engine, but you are merely desiring to get a better result from steam, and I think this will be a simpler plan, and that it will be quite as effective.

(Mr. Strong, who was not a member, was here allowed to state the possibility of expansion with the link motion, and the possibilities of taking steam at 175 lbs., and expanding it down to the atmosphere, as compared, with the gear that does not alter its compression, or exhaust with an early cut-off of the steam.)

Mr. Woodcock—I wish to refer to the extension of the side sheet above the crown sheet For the success of that very much depends upon the character of the water. Take that style of crown sheets on roads where the water is bad, it seems to me it would probably cause trouble. So we are only to judge of these plans by the localities, and these matters are brought before the convention for reference to show what was being done by this association, and it is for record that we can know and judge by these what is being done by different roads. It is not supposed, I think, that we recommend this as the only plan or the best plan, but these plans are brought before you for your information. It is the custom of this committee to gather up all the facts they can during the year, so that each member of the association may judge for himself what is the best plan.

The use of wire netting of about $\frac{1}{2}$ inch mesh for lathing has proved to be a most durable and efficient means of protecting the interior of buildings against fire. The mortar exudes through, forming a very strong bond, and surrounding the wire defends it against rust. The wire lathing used in certain Government buildings erected in Paris during the reign of Napoleon I. is still in good preservation.

The Worcester (Mass.) Free Institute of Industrial Science graduated 17 in Mechanical Engineering, 7 in Civil Engineering, one in Chemistry, and 25 with the degree of Bachelor of Science, at its recent commencement. The usual exhibition of shop work by the students took place after the commencement.

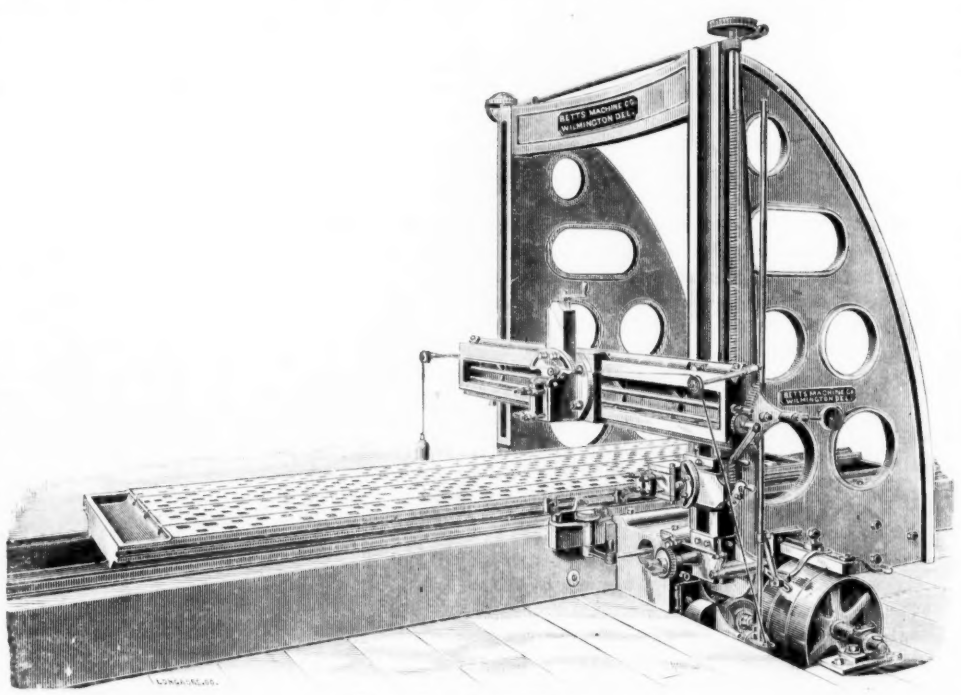
Eight-Foot Planing Machine.

We illustrate herewith the large planing machine lately built for the Smith & Sayre Manufacturing Company, of Newark, N. J.

This machine will plane 8 feet square and 16 feet long. It has one head on the cross-rail and one on the near upright, though often this class of machine has two heads on the cross-rail, and one on each upright, depending on the particular class of work for which it is intended. Each head has an independent feed screw. This machine is driven by strong and powerful gearing, giving a great amount of belt speed. The driving shafts are unusually large, and the gear wheels cut from the solid; it has quick return to the table, power feeds in all directions, and can be made to lie parallel to or across the line of shafting. The bed and table are well-braced in such a manner as to best withstand the heavy strains, and the bed-plates are of unusual length. The table is furnished with self-oilers, and the uprights have a long bearing on the bed-plate, giving steadiness to the machine when the cross-rail is at the highest point. The cross-rail is raised and lowered by power through bevel gearing; the up and down slides are worked through one rod, but are so arranged that either can be disconnected at pleasure.

Weight of the machine, 70,000 pounds.

Builders are Betts Machine Company, Wilmington, Delaware.



EIGHT-FOOT IRON PLANER.

Personal Recollections.

BY S. W. GOODYEAR.

Is it not strange that so many mechanical devices and methods are brought forward in these days when mechanics *write work*, instead of confining themselves exclusively to putting in the hard knocks of execution, as new, as modern, when the fact is, that the oldest mechanic who is still in the harness cannot remember when the same devices, tools and methods were not in use? Milling machines and milling cutters to be used for removal of superfluous metal, and bringing desired surfaces out of the rough, which only need to be finished with a rub of the file, and the subsequent polishing to be exactly alike, if pieces are made by the thousand, and just what is wanted in many shapes which the planer or shaper cannot make *exactly* at all, or, if one piece could be made, no more could be made *exactly* like it, need not be spoken of as something new. It is true that milling cutters were made in the olden times by bunglers, and used on arbors which were too slender, and did not run true; that some cutters had a big side, and were run on wobbling arbors, with all the other vile concentrated abominations that some men who are told that they don't know how, and what is more, can't learn, have been in the habit of putting into their milling plant. That such monstrosities were used by the grandfathers of the youngsters who make up the rank and file of the AMERICAN MACHINIST readers, need not be hard to believe, when the fact is, that the same kind of cutters and arbors are in use now, in *some* shops, and *some* of them were made in 1885.

If a milling cutter has its hole reamed out to exact size with a keen cutting fluted reamer, and is then turned up to diameter, thickness, and shape, on a good steel arbor of suitable length, which was made true, with a rigid adherence to methods calculated to insure its remaining true till worn out, and such arbor is used in a lathe with true centers, of proper angle, the working parts of which lathe were all properly made and fitted, and have been kept in good order, and the tools used are of suitable shape, well ground, and properly set, is it not plain to see that the cutter blank can be prepared for cutting, and be placed on the mandrel for that purpose as true and perfect in shape, as the most exacting mechanical writer could demand? Now with the cutter blank ready to cut, if a cutter of proper angle is used for the purpose, with the corner rounded off proportionately with the size of cutter to be cut, and the pitch best adapted to the work on which the cutter is to be used, so that there shall be no sharp angle at the root of the tooth to act either as a starting point for hardening cracks, or, an undue provocation for the lodgment and clogging of chips; if the front line of the tooth is cut ranging exactly with the center not with the cutting edge falling back from the radial line as is sometimes the case through carelessness, nor reaching far forward, hook shape, through intention, as by the reasoning of some is best—with the angle at the back such as to give a strong tooth, but with sufficient room for chips, and to facilitate grinding when dulled, the cutting not being carried up so close to the edge as to leave it weak, and further, if in finishing up to an edge with file, graver, or other tool a proper angle for clearance is preserved, each tooth being an exact counterpart of every other, and all brought *just* to an edge, without the loss of a particle from any to throw the periphery out of true—if all this is attended to and if the hardening is done at the proper heat to leave every tooth possessed of the greatest degree of tenacity, and at the same time showing a condition of hardness so much beyond that of anything which the cutter will be used on, as to insure long service before grinding is necessary, who will be ready to say that such cutters are not first-class? They are being made by the thousand daily. They were made when the writer was a boy. Will some older man tell us when they were not made?

But, "Of what use is this?" do I hear some reader say who has been trying to find a stray kernel among the chaff? Well, about arbors, which are supposed to run out, and make wobbling cutters.

Let *us* make an arbor on which to turn up milling cutters, by first centering the piece of which it is to be made, countersinking the centers, squaring up the ends, roughing down to an approximation of the size to which it is to be finished, turning down a place at each end for a distance proportionate to the size of the arbor and width of dog with which it will be driven, to from $\frac{1}{16}$" to $\frac{1}{8}$", more or less, smaller than the finishing size of the body of the arbor, and beveling the corners at the end off well, at a forty-five degree angle, the new corners made by beveling being rounded off into the end, and back into the circumference till lost in the respective planes. Let the countersink at the center be sufficiently deep to give a good bearing surface on the lathe centers, and of just the regulation (?) thirty degree angle, with this countersink countersunk in turn at a more obtuse angle, say fifty degrees, then flattening a side of each end to give a bearing for the screw of the dog let us proceed to harden the ends. Let us do this by carefully heating them no hotter than will be necessary to produce the desired hardness, and by the low heat, and judicious turning in the fire while heating, avoiding cracks, and reducing to the smallest limit the springing which attends hardening, and is oftener dependent upon uneven heating, than upon how dipped, or what dipped in.

The expansion of metal by heat is irresistible, and if one side of a piece of steel is heated much faster than the other, is it not plain that it must spring in the fire?

Now, with the ends of our arbor hardened, by drawing the temper to a safe degree, and turning the body of the arbor to size, we shall have a reliable tool on the start, which with decent treatment will remain true, on which to turn up cutters by the hundred, and be one of the important small tools of the shop for years. Whether you use a copper maul, wooden mallet, a piece of lead, brass, or other soft metal, or even a piece of iron or steel between your hammer face and the ends of this arbor in driving in, and out, your centers are safe, and the corners will not break or bulge.

It is a little more work to make this sort of arbors than it is to cut off a piece of round iron, and with any kind of centers in it, called "good enough," turning down a place at one end to the right size constituting all the lathe-work thought necessary on the sort of arbors which are usually thrown in a pile to be altered over, and turned to any other size for which they are large enough. But the well-made arbors with hardened ends, kept in a rack with sizes plainly marked thereon, are among the most labor-saving appliances in a well-conducted shop, and, with any treatment which they are likely to get from machinists who are worthy of the name, they are practically indestructible for all occasional jobs, and are indispensable for continuous work. New? No. They were in use when I was a boy, and a *grandfather* advised their use, and said he had always made them that way. "Did they not use odds and ends, and bits of shafting, and risers from the foundry for arbors back in the forties, when you were a boy?" does some reader ask. Yes, and do now, and always will, *but there were those who did not then, and who never will.*

I wonder if all of your readers are familiar with what I was taught to call a cannon drill? It is a half-round, one-lip affair. It cuts a smooth hole, cuts rapidly, and has the peculiar and extremely meritorious habit, seldom found in drills of other breeds, of going straight ahead, regardless of small blow-holes, sand streaks, seams, or inequalities of structure or condition, which so easily tempt drills with two cutting lips and a conical point to deviate from the straightforwardness which we pretend to expect of them, but, if found once in a year, would cause surprise, this simplest of all drills to make, the least arbitrary as to clearance angles, the most certain to cut a hole of the exact size for which it was made, will, if properly started, drill a hole of several feet in depth straight.

I have known good mechanics who saw these drills for the first time, to declare, before seeing them put to work, that they "could not cut," and have seen them look on with amazement as a needed hole through a shaft several feet in length was made by drilling from one end to about the middle, the shaft revolving in a lathe through the agency of a true live center and properly-adjusted center-rest in the same plane with the live spindle, and then changing ends, drilling so the two holes met so accurately that no line or shoulder showed the exact spot where.

Who don't believe that any drill will do this? Just you try it. Make the drill at its cutting lip exactly a half circle. Let there be ten degrees of clearance from the cutting lip. Let the cutting lip have an inclination back from front corner of five degrees. Do all the boys and amateurs see it? If not, please to imagine the half-circle piece, with end square, placed in a vise vertically to have the cutting and clearance inclination given. With the flat side from you, drop the shank of the file ten degrees and the left-hand edge of the file five degrees; file to a cutting edge clear across. This drill will be right-handed. It must have a hole in which to start, either in the piece or to be drilled, or through the agency of a jig; but once started right, it is the most rigidly supported tool, with the least possibility of chattering, or in any way shirking its entire duty, of any in use. It cannot run out. It rests with all the lateral force of the cut on the most perfectly-fitting bearing. The inclination from the center to the advance cutting corner, tends to throw that corner out just enough to give clearance. The chips which this drill will roll out, with the smooth, round hole it makes, should be an answer to all camel-back arguments in favor of springing tools. Who calls it "hog nose?" Well, well, the disrespect which is shown for some of grandfather's tools and methods by the grandsons in these days of superior advantages, with the columns of such papers as the AMERICAN MACHINIST open to them, would wring our heart-strings if we did not know that "it's all talk." Our old tools are still in use. They are used by workmen and bunglers, just as they always have been.

"Julius Cæsar's" assumption that none but adepts are machinists, don't strike me as sound. Is the old crab that draws the huckster's cart fourteen miles in fifteen hours any less a horse than are Maude S. or Jay-Eye-See? Will these last be any more horses if they trot in two-seven, or even in two minutes, this summer? There be good machinists and poor ones, Julius. Don't, I beg of you, try to fill all the places with *best* men until you feel sure that raw material will hold out. Time and patience have made first-class machinists of those who were called blockheads by all hands and the boss, while some of the exceptionally bright boys, with their heads full of book knowledge, have never learned even to clean castings well. How are we to know till a blade is sharpened how keen an edge it will carry? Boys, ye are the blades. In such letters as those of Hobart, Richards, West, Sellers, and other practical men who contribute to make the AMERICAN MACHINIST so essentially a mechanic's paper, is much to bring you to an edge. Always strive to adopt the best tools and methods, be they new or old; and we old fellows won't laugh at you much if you do, sometimes, become enthusiastic over the discovery of the advantages to be derived from the use of some of our old tools and methods.

The *Railroad Gazette*, of June 26, has information of 677 miles of new railroad track laid this year, as against 1,104 miles for same time in 1884, 1,966 miles in 1883, and 4,166 miles in 1882.

The Speed of Drills.

We take the following from a new catalogue of the Cleveland (O.) Twist Drill Company:

"This table has been compiled from memorandum furnished us at our request from about 500 of the best known and most successful manufacturers in this country. We believe these speeds should *not be exceeded* under ordinary circumstances. A feed of one inch in from 95 to 125 revolutions is all that should be required according to the size of the drill. At these speeds it will be necessary to use plenty of oil, or a solution of oil, potash and water, when drilling steel, wrought or malleable iron."

Diameter of Drills.	Speeds on Steel.	Speeds on Iron.	Speeds on Brass.
1/16	1150	1750	2000
1/8	575	1000	1200
3/16	425	700	900
1/4	285	450	800
5/16	255	400	650
3/8	210	325	500
7/16	170	275	425
1/2	145	220	375
9/16	135	200	335
5/8	125	180	315
11/16	115	160	275
3/4	105	130	250
13/16	90	120	205
7/8	80	105	175
15/16	70	95	150
1	60	90	145
1 1/16	60	85	135
1 1/8	55	80	130
1 3/16	55	75	125
1 1/4	55	70	115
1 5/16	50	65	110
1 3/8	50	60	105
1 7/16	45	55	100
1 1/2	45	55	100
1 9/16	45	50	95
1 5/8	40	50	90
1 11/16	40	50	85
1 3/4	40	48	80
1 13/16	35	48	75
1 7/8	35	45	65
1 15/16	30	45	60
2	30	45	55
2 1/16	30	43	50
2 1/8	28	40	50
2 3/16	28	40	45
2 1/4	28	38	45
2 5/16	26	38	45
2 3/8	26	35	40
2 7/16	26	35	40
2 1/2	23	32	40
2 9/16	23	32	35
2 5/8	23	32	35
2 3/4	20	30	35
2 7/8	20	30	35
3	20	30	35

Progress of File-Making.

The changes in manner of production of files have been many and varied. Centuries ago the skins of fishes' bellies were the most primitive files used, and as time went on, and metals became better known and more generally used, other devices for filing had to be substituted in place of the skins of fish, and the metallic file sprang into existence, but in shape so curious that to-day, except for the teeth, a mechanic would not recognize them. As the mechanical arts progressed, so advanced the manufacture of files. From Switzerland came all kinds of small files, curious in shape and fine in tooth, designed for the making of parts of clocks, watches, jewelry, etc. From Germany and England came the files for use on machinery, the files varying in length from 3″ to 30″, the largest being made with a tang at each end and worked by two men, one at each end of the file.

The inventive genius of man so devised mechanical contrivance that by use of chisel and cutting tool the large mass of metal was reduced to proper shape by a much less laborious system than filing by hand, so that at the present day it is a rare thing to find a 20″ file in use, and the bulk of files run in size from 16″ down to 2″ in length.

In this country, about twenty years ago, the old process of producing the teeth on files by means of a chisel and hammer in the hands of a man was supplemented by a machine, which, though crude, gave evidence that at some later day the machine would, to a large extent, take the place of the hand labor, and the present day sees this accomplished. There are 3,500 tons of steel used yearly in the United States in the manufacture of files, and several concerns have a capacity of from 500 to 1,000 dozen files a day, making on the machine files with teeth so fine that the magnifying glass has to be used to discover the tooth, and so coarse that twelve teeth cover a square inch of surface.

J. D. FOOT.

LETTERS FROM PRACTICAL MEN.

Hardened Parallel Pieces.

Editor American Machinist:

Can you tell me where to find a "planer hand" who has not had trouble to hold thin work in a planer vise, especially if he had to replace it in the vise just as it was to take another cut over it?

I have lately made some small parallels to use with my 6″ vise, of steel hardened and ground to standard size. I do not see any good reason for not having hardened steel parallels, just as well as hardened mandrels. They look a great deal nicer than to go to the "everlasting scrap heap," and dig out an old pulley arm and make a parallel out of it. When you get it done you are ashamed of it. If you don't look out you will get chips bedded into it, and you have got to take a file to get them out. This, in time, will wear out of truth, but it will be used just the same. The corners will get bruised, which will raise a hump on two sides which will be pened back with a hammer or planer tool. Now, with a hard steel parallel you have none of this trouble.

Once in a while a job will come along and it becomes necessary to make a parallel out of cast iron. I do not like to take any chances on it, so after it is planed I put it into the grinding machine and make it right. It don't take over ten or fifteen minutes, and you have it true enough to swear by.

PARALLEL.

The Tangye Engine Bed.

Editor American Machinist:

I have examined with pleasure the illustrations you gave in your issue of the 10th of January last of the new type of Buckeye engine, but I must regret to find that since the 17th of March this engine has been described in your advertising columns as the Tangye engine. In Europe it is, I believe, universally acknowledged that this type of bed originated certainly with your countryman, Chas. T. Porter, who showed an engine on this system at the Paris Exhibition in 1867, Tangye commencing to put his on the market in 1871. I think no mechanic can look on the two designs without being struck with the vast superiority of the original one.

I notice you are a persistent advocate of protection, objecting as much to German as to Chinese cheap labor, so that high wages may be obtained for the workpeople and high profits for the masters; but does not all this come out of the pockets of the American people? AUDI ALTERAM PARTEM.

Westminster, London, 9th June, 1885.

Grinding Tools.

Editor American Machinist:

I surmise one reason for the tool catching when grinding from the front of stone, as told by "F" in your issue of June 20th, and that is the tendency many careless ones have of stubbing the tool, and not preserving the proper cutting angle.

Jack has a nice steel arbor to make. He is one of your mercurial fellows, quick and impulsive, (they make excellent men) and has started to work at that arbor with the intention of making it the best piece of work turned out of the shop. The fits are to be exact, the collar to have just the right chamfer, the threaded end must be correct, etc. For a time all goes well. The steel is annealed to a nicety, the tool is tempered well, and has a nice cutting angle. Jack whistles and compliments the blacksmith as he spins off the long beautiful curls. But alas! Jack in his desire to make that curl just an inch longer, lets the tool run up too far and off goes a slice half way down the cutting angle of the tool. Jack takes the tool from the post, and, as he hurries to the grindstone, he examines it carefully, hoping to find a water crack, so he can reverse his opinion regarding the blacksmith, but no such crack appearing, he accepts the situation, gets in front of the stone, and now he thinks of the nice job he was to make of that arbor. His mercurial temperament again pops up, and, in his hurry, he begins to stub that tool, when crish, it digs into the stone, and tips up, taking the skin from his knuckles, and filling his eyes with grindstone dust.

Jack looks to see if the boss is around, and goes to the back of the stone. The grindstone gets a nice little gutter, which looks very innocent while in motion, but when the tool maker comes along to grind the thread tool he is using on that new tap, all unaware of that gutter, he suddenly runs into it. Again the spray of dust, bleeding knuckles, and the back of the stone. Moral: Do not be in too much of a hurry at the grindstone; hold the tool at the proper angle, and if the rest is firmly placed and fashioned rightly, little fear need be had of the front of stone, while a much better cutting edge can be obtained there, and the grinding intelligently done.

I recommend for a rest an iron frame running across face of stone, down at sides, and bent at right angles to form feet, with slot in each foot for two bolts. Now put braces from toe to toe on each side to avoid spring; have the stone true, move the rest up within ¼″ of stone, fasten firmly, take one-half as much interest in grinding the tool as you do in finishing the work, and the time spent at the grindstone will be rewarded at the machine.

Jack came back to the front of stone again, and it happened in this manner. He had been up late the previous night, and was feeling as if he wanted a soft job. He did not have one, so he took a side tool just from the blacksmith, and, going to back of stone, got a splendid position where he could grind the tool and rest himself. Jack went to sleep; the stone didn't. It ground the tool, it ground through Jack's overalls, a watch charm, two buttons and 3/16″ of epidermis. Then Jack awoke, got disgusted, and went to the front of the stone.

H.

Grindstones and Tool Grinding.

Editor American Machinist:

The recent discussions on the grindstone question are in the right direction. Anything that will help machinists to keep their tools in better shape will enable them to do more and better work. First-class grinding facilities pay a bigger dividend than any other investment in the shop.

It seems to me that there is another side to this grinding business besides the two already ventilated. This shop used to contain a pretty fair grindstone rig; I remember it in connection with the mashed thumbs and skinned knuckles I acquired while taking my first lessons in tool grinding. Learning by experience to pay more regard to personal interests, I became, after a time, able to wear down a tool into quite presentable shape, but it was always a slow and disagreeable operation, and often when I had a lot of steel to grind off some tool, I would look longingly towards the emery-wheel rig that occupied a convenient position by the Putnam lathe. The belt was off the pulley, and I had never seen it run. One day an enterprising workman put the belt on and started to do some grinding. He didn't grind a great while, which was fortunate, for the thing was just getting ready to shake the shop down.

After he had had the emery picked out of his eyes, and his tool tempered, he finished grinding it—on the grindstone.

After a while, an emery wheel, about 16″ in diameter by 4″ face, was installed in the shop. It answered the description given by "P. J. F.," in your issue of June 20, except that it had no slide rest. Running slow, and being constantly wet, it was about the same to grind on as a grindstone, but it wore off steel considerably faster. It did fair service, and was the stepping stone (if you can call an emery wheel a stone) to something better in the shape of an emery wheel rig that was not so pugilistic and did not interfere with conversation so much as the old one near the Putnam lathe. This new machine was a home-made affair, but it was built for business. The frame, weighing between 300 and 400 lbs., stood on three legs. An 1¼″ arbor, driven some 1,800 revolutions by a 4″ belt on a pulley 4″ diameter, carried two wheels of 12″ diameter. One of them was a soft wheel of medium grade, and was used exclusively for grinding steel; the other was harder and coarser for general work on iron. A wheel that is right for tempered steel will not work well on iron, and should not be used for it. The soft wheel in this case was ¾″ thick, the hard one 1″. The rests were flat, about 4″x6″. A groove was turned in the fast collars which prevented any oil from the boxes getting on the wheels. The countershaft was directly over the arbor, and the belt just about tight enough to take the weight of the arbor and wheels. This is quite a help where an arbor has to run continually, as this did.

A pail of water standing on a nail keg, close to the tool wheel, completed the apparatus, and it was turned over to the tender mercies of the shop hands.

For the next two weeks it was about one man's business to true up emery wheels, pick emery out of boy's eyes, and temper tools over again. Only one man in the shop—the old pattern maker—could use it properly, and though the rest of us made bad enough work of it, yet the way he would grind up his delicate-edged tools, using the emery wheel in preference to the grindstone, gave a glimpse of what was coming when the boys got the hang of it.

That was quite a long time ago, and the boys have learned their lesson well. The grindstone is laid aside, and the emery wheel reigns supreme, as I believe it will in any shop where it is given a fair chance, and the men are taught to use and not abuse it. Handled properly, an emery wheel that is right for the business, will grind a tool in much less time than a grindstone, while the absence of mud and water, the greater accuracy and sharper corners of the wheel enable the tool to be ground in better style, and into shapes, which would be impracticable on a grindstone. In grinding a thread tool, for instance, the workman doesn't have to bear on, consequently he can hold it where he wants it. He can see just what is going on, and can grind as near 60° as his eyes can judge before trying the gauge.

As for drawing the temper, that is something the boys do when they don't know any better. They don't do it after they learn how to use an emery wheel.

E. J. ARMSTRONG.

Information Asked and Given About Turning Shafting.

Editor American Machinist:

In a late issue of the AMERICAN MACHINIST I saw an account of work done on 2″ shafting by L. S. Graves & Co., in which they stated that they had finished at the rate of 315 feet of that size in ten hours. I would like to inquire what feed was used in this instance. Also, whether the time included changing shafts. I took it for granted that the iron was straightened, ends squared up, and that the bars were not much less than 20 feet in length. I use about one-eleventh-inch feed in turning 2″ shaft, and produce good work; but with coarser feed the quality of the work suffers; this with three tools attached to one rest, using both oil and water on tools. With this feed I cannot produce any such results as that given.

E. A. DELANO.

Working Out Core Boxes.

Editor American Machinist:

Your correspondent, Frederick Leu, in his article on "Short Method of Working Out Large Core Boxes," in AMERICAN MACHINIST, page 6, under date of June 20, is not quite correct in the latter part of his article. You *can* hollow out a stave whose circle would be of same diameter as saw in the manner described. But in clamping the straight

edge at an angle of more or less than 90° from face of saw the shape cut will be elliptical. D. W. H.

Good Oil and Fuel Account of a Locomotive.

Editor American Machinist:

To correct fault and remedy abuse is essential to success in any occupation. In suggesting improvement in oil holes for valve motion, Brother Engineer J. A. Hills has presented a broad field for criticism if not advancement. Valve motion, and especially link, must be exceptionally difficult to get at on the style of "crab or contracted hog," described by Mr. Hill. I cannot see that facts stated set aside former objections. The bearing would not be better protected from grit, in running down hill with engine at full stroke. The lower hole would be especially inviting for deposit of sand and grit. Not any plan as yet within my ideas would suit better than oil cups before described. If they cannot be inserted in ordinary place, what is the matter with placing them on elbow in the outside end of pins. Those ash heaps might be improved by calling attention of superintendent or track master to their destructive work and having some one exercise on them a few minutes every day.

A foreman, or master mechanic, who will allow an engine to run with cut valves, or until worn, so that a valve stem will show $\frac{3}{4}$" lost motion, spends a stock-holders, big dollar to save a departmental shilling, and then cuts down wages to save expenses.

As a good engineer you certainly keep your brasses reduced to proper limit, your wedges set up, and if one sticks and cuts you have it taken down and put in shape. Why not have new pins put in, a rocker-box closed if necessary, and this lost motion in valve gear taken up, and kept up, as long as the different rod and link bearings will stand it? Anything, I suppose, is good enough to run through a sand storm.

Time was when any kind of an old rattle-trap that wouldn't steam or give a decent exhaust was considered good enough to buck snow; now machinery in the best of shape is not considered too good to carry a snow plow, and you can, in consequence, find the Northern Pacific open every day in the year.

I run a 40-ton standard engine, 17"×24", 5 ft. wheel, built at Portland works from dimensions furnished by Geo. W. Cushing, our superintendent of machinery; Baldwin patterns for machinery. This engine was turned out of Brainerd shops, managed by H. Z. Small, assistant superintendent machinery, and his general foreman, James McNaughton, early in April, after a general overhauling. It had soft bearings for journals, and oil cups with spindle feed on engine truck, feeding through center of brass directly on journal; an 8-inch air pump with regulator; sight-feed lubricators for cylinders and air pump; steam jet arrangement for preventing smoke, and other arrangements for comfort and efficient work. No improved oil holes for valve motion. A piece of writing paper can barely be inserted between gibs and guide-bars, and other parts are fitted to correspond. In the month of May this engine made 4,155 miles on night passenger run, averaging 30 miles to pint of oil; subtracting illuminating oils we made 37 miles to pint.

Early in June I ran this engine on a special 64 miles without shutting off steam; another stretch of 66 miles; still another of 70 miles without stopping. In a run of nearly 500 miles made between daylight and dark in one day, on arrival at terminal point, having covered the home stretch for 40 miles at a good 50 miles an hour, the engine was as cool and in as good shape as when starting, having made 419 miles to one quart of valve oil; used machinery oil in proportion to May average, and covered the returning 218 miles with a little less than 2½ tons of coal.

I do not count this as wonderful, but I do set it down as first-class work in the light of which silence is vocal concerning our machinery department.

I sympathize with you, Brother Hill. I have seen your alkali plains, and your "hogs"; have heard your sand storms described, but never got caught in one. It is a case of Dives and Lazarus.

J. E. PHELAN,
Locomotive Engineer.

Brainerd, Minn.

A Defence of the Friction Clutch.

Editor American Machinist:

I have been watching "Grinding Tools," "Cutting Tools," "Doing Difficult Jobs," "The Use and Abuse of Friction Clutches," etc., with interest, looking for what the next week will bring forth. I was glad to see Mr. Goodyear come out in favor of the friction clutch. I think that any machinist (?) who would take a hammer and chisel to fix even an old style of friction (and I will admit that they will bother once in a while, as I have used them for several years) ought to be given a vacation.

I will give you a few facts in regard to a friction countershaft that has been in use driving a 14" Putnam engine lathe, about one-half the time working steel, the rest of the time on brass-work, with considerable chucking of brass. The overhead belts are 2¼" wide; the speed belt, 2" or 2¼"; clutches, 8" diameter. This counter has been running 66 months on job-work, and has had the regulating screws changed only three times. This friction, I believe, is the "Burleigh," with Arnold's improvement. In construction, the pulley is turned inside, and a friction band engages it; this band is cut in halves—fast one end of each half, movable at the other. The countershaft I refer to has been taken care of, not abused, kept oiled in or on all working parts, and a two-pound pull on the shipping lever will reverse it at any time, without any danger of breaking or pulling anything down.

S. A. C.

The Draftsmen's Association.

Editor American Machinist:

I have long ago thought that an association of draftsmen was specially needed in this country. Therefore, I am more than pleased to read in your valuable paper that such is about to be organized. Nearly all skilled departments are profiting by meeting and discussing collectively; and besides, shall I confess it, there are to be met in the experiences of most draftsmen "wrongs" that could be regulated in part, if not wholly eradicated, by the influence of just such an association. My experience extends over twenty-one years, and allows me to offer my sincere thanks for the publicity you are giving this movement. OMAHOG.

Modern Locomotive Construction.

BY J. G. A. MEYER.

THIRD PAPER.

When an engine is running on light rails about 30 pounds per yard, we may place 4,000 pounds on each driver; and when an engine is running on heavy rails we may place 15,000 pounds on each driver. In late years the tendency has been to crowd all the weight on the drivers that can possibly be placed on them, so that now on some roads more than 15,000 pounds are placed on a driver. But there must be a limit to this weight, because when too much weight is placed on the drivers, either the tires, the rails, or both will wear too fast. The exact amount of weight that can be placed on the drivers has not yet been satisfactorily established, but we believe that the foregoing figures, namely 4,000 to 15,000 pounds on each driver may be safely adopted.

From these remarks it must be evident that before we can decide which of these two figures we can use, or what amount of weight between these two limits we may adopt, we must know the material of which the rails are made, and the weight of rail per yard, that is, their form and size. Of course, we are now alluding only to rails for ordinary passenger and freight engines on roads of 3 feet gauge, or other roads up to 4′ 8½″ gauge, and we do not include the rails for mining engines, plantation engines, or wooden rails.

Another important fact that we must not overlook is the weight the bridges can bear, because the rails may be suitable for a heavy load, and the bridges may not be so.

If then, we know the weight that can be safely placed on each driver, we can find the number of drivers to be placed under an engine by Rule 2. Divide the weight that must be placed on all the drivers by the weight that can be safely placed on one driver, and the quotient will be the number of driving wheels required.

Ex. 3. The greatest weight on each driver that the rails of a given road can bear is 10,000 pounds, and the weight necessary on all the drivers to haul the train is 40,000, how many driving wheels must be placed under the engine? According to rule we have $\frac{40000}{10000} = 4$, hence the number of drivers will be four. If the necessary weight on all the drivers had been 60,000 pounds, we then would have to place six drivers under the engine so as not to exceed 10,000 pounds on each.

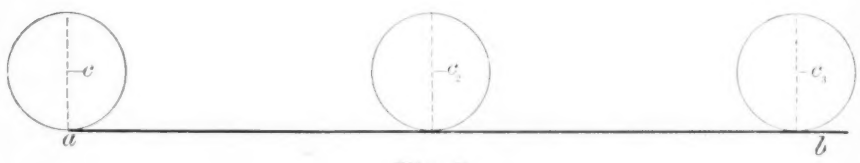


Fig. 7.

DIAMETERS OF DRIVING WHEELS.

The diameter of the driving wheels under an engine will, to a great extent, depend upon the speed of the locomotive. Driving wheels of large diameter are necessary for fast speeds; and, on the other hand, driving wheels for heavy freight engines must necessarily be comparatively small in diameter. There are several causes which will place a limit to the diameter of a driving wheel in either direction. We will name two: The diameter must not be too large, because, if it is, the engines will stand too high. The diameter must not be too small, because, if it is, difficulty will be experienced in getting steam out of the cylinder on account of the high piston speed which may be necessary for the required speed of train. Between these two limits no exact rule for finding the diameter of a driving wheel can be given. The following tables will greatly aid us in determining the diameters of these wheels. These tables show the diameters of driving wheels for the different classes of engines, such as are generally adopted by builders and master mechanics, and giving good satisfaction.

In these tables we see that, for an eight-wheeled engine, with cylinders 10" in diameter and 20" stroke, we may use driving wheels 45" diameter, or larger, up to 51" diameter; or, if it is an eight-wheeled engine, with 17"x24" cylinders, we may adopt driving wheels 60" diameter, or larger, up to 66". Of course, these limits of driving wheels for the different classes of engines are not absolute. We may change, and, indeed, may be compelled to change, these diameters to suit some particular service.

But it must be remembered that when the number of revolutions of the driving wheel per mile are given, then the diameter of the driver is not a matter of choice, but must be found accurately by calculation, and which is an easy matter. Thus, for instance, the number of revolutions of the driving wheel per mile is 336; what must be the diameter of the wheel? One mile is equal to 5,280 feet; then dividing the 5,280 feet by the number of revolutions, namely, 336, we have $\frac{5280}{336} = 15.71$. This quotient is the number of feet in the circumference of the wheel.

TABLES SHOWING THE DIAMETERS OF DRIVING WHEELS AS GENERALLY ADOPTED FOR DIFFERENT CLASSES AND SIZES OF LOCOMOTIVES.

All Dimensions in inches.

TABLE 1.

EIGHT-WHEELED ENGINES.

Column 1 Cylinders. Dia. Stk.	Column 2 Driving Wheels. Diameter
10 x 20	45 to 51
11 x 22	45 to 51
12 x 22	48 to 54
13 x 22	49 to 57
14 x 24	55 to 61
15 x 24	55 to 66
16 x 24	58 to 66
17 x 24	60 to 66
18 x 24	61 to 66

TABLE 2.

MOGUL ENGINES.

Column 1 Cylinders. Dia. Stk.	Column 2 Driving Wheels. Diameter
.....	.....
11 x 16	35 to 40
12 x 18	36 to 41
13 x 18	37 to 42
14 x 20	39 to 43
15 x 22	42 to 47
16 x 24	45 to 51
17 x 24	49 to 54
18 x 24	51 to 56
19 x 24	54 to 60

TABLE 3.

TEN-WHEELED ENGINES.

Column 1 Cylinders. Dia. Stk.	Column 2 Driving Wheels. Diam.
.....	.....
.....	.....
12 x 18	39 to 43
13 x 18	41 to 45
14 x 20	43 to 47
15 x 22	45 to 50
16 x 24	49 to 54
17 x 24	51 to 56
18 x 24	51 to 56
19 x 24	54 to 60

TABLE 4

CONSOLIDATION ENGINES.

Column 1 Cylinders. Dia. Stk.	Column 2 Driving Wheels. Diam.
.....	.....
.....	.....
.....	.....
For Narrow Gauge.	
3′ 0″ to 3′ 6″	
14x16	36 to 38
15x18	36 to 38
.....	.....
.....	.....
.....	.....
For 4′ 8½″ Gauge.	
20x24	48 to 50
22x24	50 to 52

Now, if we refer to a table of circumferences, we find that the diameter of a circle, whose circumference is 15.71, is equal to 5 feet. If such a table is not at hand, then divide the 15.71 feet by 3.1416, because the circumference is always 3.1416 longer than the diameter, and the quotient in this case will be 5 feet, which is the diameter of the wheel.

The reason why 5,280 is divided by the number of revolutions per mile is so simple, and yet it is generally not so well understood among mechanics as we might expect, and therefore the following explanation is offered:

Let the line *a b*, Fig. 7, represent one mile—that is, 5,280 feet—and *c* the center of the wheel when it stands at the end, *a*, of the line, *a b*, as shown in the figure. Carefully rolling this wheel without slipping along the line *a b*, until it has completed one revolution, or made one complete turn, the number of feet that it has traveled along the line *a b* is equal to the number of feet in its circumference. Now, if this wheel is 5 feet in diameter, its circumference will be 15.71 feet, and the distance from the center *c* to the center c_2, which is equal to the distance that it has traveled along the line *a b*, will be 15.71 feet. Again, if we continue rolling this wheel along the line *a b* until it has made another complete turn, then its center will be at c_3, and the distance that the wheel has traveled from the point *a* along the line *a b* will be equal to the distance between the first center *c* and c_3—that is, 31 42 feet—which is obtained by multiplying 15.71 × 2; and so on for every revolution it will travel 15.71 feet further; and therefore, if we divide the length of the line *a b*, or one mile, by the circumference of a wheel, which is, in this case, 15.71 feet, we will know the number of revolutions that it must make to travel from *a* to *b*. And conversely, if we know the number of revolution per mile, we divide the number of feet in a mile, or, as in our example, the length of the line *a b* by the number of revolutions, and the answer will be the circumference of the wheel, and dividing this circumference by 3.1416, its diameter will be known.

Polished steel or iron surfaces may be preserved from rusting, through exposure to dampness, by covering the surface so exposed with a mixture of powdered lime and oil.

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Dangerous Excursion Boats.

The usual overcrowding of the old tubs, called by courtesy steamboats, of which the excursion fleet of New York is partly composed, has begun this year as usual, only in an aggravated degree. Many of these superannuated curiosities should not be permitted to run at all where the water is deep enough to drown children, instead of which they are allowed to be run anywhere, crowded with passengers to an extent that would be dangerous even in the case of the staunchest excursion boats. So long as this is allowed, thousands of lives are imperiled every day, and an accident is liable to happen at any time that will fill the city with horror. These ancient craft, unfitted for other service, sold for about what they are worth to break up, and put into service for excursions, in addition to danger to life which they cause, are responsible for the larger part of the overcrowding and attendant discomforts of excursionists. Being overcrowded themselves, they compel overcrowding of other boats to keep up the competition. A large part of the inhabitants of New York City are dependent upon the service of excursion boats for the only opportunities for getting for a few hours away from the heat of the city, and they could hardly be worse served. The condition of these boats, and the manner in which they are crowded, is a matter in which the inspectors of steamboats are popularly supposed to have some voice, so far as seeing that the law in the matter is enforced. We do not believe the law is enforced. Someone will be blamable when a disaster happens of the kind that is sure to occur, if this use and overcrowding of excursion hulks is permitted much longer. There are some boats in this service that are satisfactory in all respects, except that they carry too many passengers. But there are not enough of them, and will not be, so long as they must be run in competition with boats that cost comparatively nothing.

Street Car Motors.

Every day the demand for an acceptable street car motor becomes more apparent. Against motors so far tried there have been more or less objections, but to the observer it hardly seems that any of them have been tried with very much persistency. Many objections to something so much of an innovation as the doing away with horses on street cars, are simply prejudices which a reasonable amount of persistence would overcome. If it were not for the fact that it is so easy to fall back upon the use of horses, no doubt a motor entirely acceptable would have been found before this, but it seems to be easier to go back to the old method than to persevere in overcoming the difficulties that may be expected in the way of the application of any motor. There is a place for a motor that is just right, but the owners or officers of street roads have so far shown but little patience in their trial; they expect impossibilities in the way of something that shall be just right at the first trial. An electric motor for street roads would seem to possess special advantages, but does not seem to receive much attention. The first successful motor for this purpose that is placed on the track will have an important start in the race. In the meantime, unless there is more activity in the matter, wire cable propulsion may be improved until the introduction of any motor will be more difficult than at present. Important improvements are believed to have been recently made in cable roads, and perhaps with others to be expected it may be found the most desirable means of operating surface roads. However this may be, it is reasonable to suppose that horses will not always be used for the purpose.

It is sometimes necessary to look far from home to obtain local news. The following item we find in the *Denver Journal of Commerce:* "The New York Elevated Railroad has thoroughly tested the matter, and will in a short time adopt the electric system for its line, in preference to steam." This is the first news we have had about such a determination. We did not even know that electric locomotion had been tested at all on the elevated roads of this city. We have heard much talk about trying it, and have seen an electric motor for the purpose under construction in this city, but this is all we knew had been accomplished—unless it be the placing of stock of the company proposing to make the trial.

The Pittsburgh *Commercial Gazette* publishes an interview with one of the largest nail manufacturers in the country, who says:

"Wherever iron is now used for structural purposes steel will take its place. For years hammered iron has been regarded as indispensable for certain uses in the make-up of locomotives. A firm in the Ohio Valley, a day or two ago, sent tons of steel to the largest locomotive works in the country to be used to the exclusion of iron. Steel bridges, steel horse-shoe nails, steel horse shoes, steel engines, steel everything, will be the rule hereafter. On account of this substitution all active manufacturers are making ready for the inevitable, and it is only now a question of rapidity of change with them. Blast furnaces will hereafter make Bessemer iron instead of pig iron. There is what I call a steel craze in the land just now."

It does not seem unreasonable to believe that iron will be successfully made by a direct process as well as steel. A prominent manufacturer of rolling mill machinery said to us a short time ago: "Puddling iron is out of date. The puddlers' occupation is gone, but they don't know it yet."

English versus American Axes.

We have had occasion at different times to notice the efforts of British manufacturers to compete with American houses in the axe trade, especially in British provinces, and notably in Australia. That these efforts have not been entirely—we might say in any very noticeable degree—successful, we have frequently quoted from English journals to show. English manufacturers have within the past ten or fifteen years improved the model of their axes very materially, for which there was abundance of room. But it is evident that there is something not right about them even yet. Something not so palpable as the form.

Our contemporary, the *Ironmonger*, has given a good deal of attention to the axe question, and for the past few months has, so to speak, fairly bristled with communications relating to the subject. All sorts and conditions of axes have been discussed by its correspondents, but progress towards perfection is apparently slow, as evidenced by a communication appearing in its issue of June 13. We quote from the communication referred to:

"My experience of English axes is a very unfavorable one, for I can safely assert that out of every dozen felling axes my firm sells, we get five or six returned faulty, and in all cases the temper is too hard. We stock a first-class make from the Midlands and a local make of good reputation, but neither the one nor the other is reliable. I will give an instance of what took place only last week. A wood-cutter walked a distance of seven miles, purchased one of our felling axes, ground it, and returned to his work. This trying ordeal the axe stood without making any objection, but as soon as the owner began to cut the timber a good-sized chip flew, not out of the wood only, but from the axe as well. He then had to tramp two miles to a grindstone and two miles back to his work, but all to no purpose, for again the axe chipped as well as the tree. The poor fellow was obliged to do another seven miles to exchange the tool and seven miles back again, with no certainty of being more successful with the next one. This caused a walk of eighteen miles unnecessarily, and the loss of a day's work into the bargain. I am not stating an isolated case by any means, as numbers of ironmongers can testify, and felling axes are not generally used close to towns, so that in nearly every case a faulty tool entails a long tramp and loss of time to men who can ill afford it. Now, sir, if such cases as these are frequent in the old country, can we wonder that, when they occur in the colonies, the buyers prefer to pay more for a reliable article made in America than they will for a doubtful one from England? There is no excuse, in the case I have referred to, of making to pattern, or being bound to use a certain steel, or anything of the kind. It is a stock pattern with all makers, the price quoted is paid without murmur, and yet, as I have asserted, the average returned would be not less than five to the dozen."

The above is undoubtedly exactly true. It is difficult to establish and maintain a reputation for doing everything better than anyone else. It may not be entirely agreeable to English manufacturers to do so, but we think, if they are entirely ingenuous, they will admit that they cannot make axes that will equal those of American make. We are also of the opinion that they will find, if they look far enough, that there is a good deal to an axe besides the steel it is made of, the temper given it, or its form, even. American axe manufacturers have not, as it were, tumbled into the secret of making good axes. From some knowledge of the industry, we are prepared to say that it has taken a good deal of study to perfect so simple a tool as the axe. The condition of this country called for something more than good in the way of an axe, and American manufacturers furnished all that could be desired. Nothing is more natural than that British colonists, where the conditions are about the same as in this country, insist upon using American axes. This, we venture to predict, they will do for some time to come—at least, until English manufacturers succeed in doing better than the correspondent of the *Ironmonger* pictures them as doing. What would American manufacturers think of having five-twelfths of their product returned as worthless?

In a paper read before the Inventors' Institute (England), Mr. Wilkinson described a street tramway locomotive, of the inverted vertical cylinder type, the power being transmitted from the crank shaft to the driving axle by means of worm gearing. In this paper he remarked that on one of the Lancashire tramways, worked in part by horses, and in part by steam, horse-power cost 65 per cent. more than steam. The cylinders of the locomotive described are $6\frac{3}{4}'' \times 7''$, and the piston speed at 8 miles per hour, 436 feet. The worm used was treble-threaded, having 15 teeth, giving a purchase of five to one. The boiler tubes are only one foot in length, and are bent into reverse curves so as to relieve themselves of the effect of expansion.

Public versus Private Ownership of Gas-Works.

The Philadelphia correspondent of the New York *Sun* says:

Our city gas-works manufactured 2,557,678.000 cubic feet of gas during the year 1884; they carbonized 280.691 tons of coal, and received $3,677,042 68 during the year from sales of gas, coke, tar, etc. The 13,555 public lamps were supplied with gas without cost to the city, and notwithstanding this the profits arising from the operations of the gas-works were $814.132 27 for the year 1884, with gas at $1.70 per 1,000 cubic feet. With the cost of supplying public lamps with gas, and lighting and maintaining them, added to the profits of the works, the profits would have reached $1,200,000, equal to six per cent. dividend on a capital of $20,000,000.

Our water-works yield us an income of $1,760,716 92 a year, or a net profit of $1,086,000, equal to a six per cent. dividend upon a capital of $18,000,000.

What a contrast the above showing presents to the gas account of New York, Brooklyn, and most other large cities. Here the gas-works are owned by arrogant private corporations, who, through legislative enactments, enjoy the monopoly of taxing the people $2 a thousand feet for gas, and the city about what they choose, for lighting the streets. If a consumer is charged for more gas than he has used, it is useless to complain, for he has absolutely no redress. If he doesn't pay the bill in full, he is cut off in darkness. Consumers decided to appeal to the Legislature, and last spring a bill was introduced to cut the price of gas to $1.50, and establish a supervision of meters. The gas corporations came forward with sufficient ready cash to defeat the bill

when it was put to vote. Notwithstanding the bitter experience with gas under control of monopolists, there are those who regret that the city's water-works are not owned by a private company.

The experience of Philadelphia, as compared with New York and Brooklyn, ought to be a warning to all new towns never to allow private corporations to control the gas required by the citizens.

The letter on another page, signed with a Latin phrase, comes from a prominent London engineer, who knows that the origin of the so-called Tangye engine bed is traceable to Charles T. Porter.

The rolling mill owners west of Pittsburgh seem to look upon the settlement of the wages question for another year in a very unsatisfied way—at least, quite a number of them do. They want to contest the wages scale still further, with the hope of having it reduced still lower. They condemn the Pittsburgh mill owners for agreeing to the scale presented by the workmen, which conceded a reduction of ten per cent. The general public, however, will be glad of the settlement that has been made, and will rejoice to see the mills running without having reached the lowest hard-pan proposed. Wages and product are both low enough now. Greater firmness tending towards an advance is what will help trade.

Literary Notes.

Our contemporary the *Northwestern Miller*, of Minneapolis, is publishing a novel in weekly installments with fine illustrations. Millers of a romantic taste will appreciate this new feature of trade journalism. The paper is well conducted and a little fiction will suitably season the large array of facts presented in every issue.

The Mining Herald and Colliery Engineer, Philadelphia, gives a $150 life insurance policy to every subscriber who pays $2 50 for a year's subscription. Without the policy the subscription is $2. Most subscribers take the policy.

A friend sends us a copy of *Mechanical Progress*, "a monthly journal for engineers, machinists, founders, boiler makers, pattern makers, blacksmiths, etc.," which hails from London, England. The sub-title seemed somewhat familiar to us with the exception of "etc.," which is a branch of mechanics to which we have not yet been introduced. It's too vague to be American as applied to mechanics, and it must be "English, you know." Turning over the cover, which is of a delicate salmon color, we find some editorial announcements, one about not publishing anything in the reading columns for pay or in consideration of advertising patronage; one about inviting correspondence from practical machinists and others "specially interested in the occupations we represent, on subjects pertaining to machinery;" one declaring that every correspondent in order to ensure attention should give his full name and address; and another notifying subscribers that they can have their mailing address changed as often as they desire. These four announcements are the same that have always appeared in every issue of the AMERICAN MACHINIST. No attempt has been made to improve the phraseology or punctuation. Our other standing announcement that "We are not engaged in procuring patent rights, or in selling machinery, nor have we any pet scheme to advance, or hobby to ride" has not been appropriated, doubtless because it does not fit the publication under notice. The department of "Letters from Practical Men" seems to have a fair beginning, and that of Questions and Replies to Questions promises well. But what's this we see? A department of Mechanical Humor. It is well that the matter under this head is duly labeled, for, aside from a sketch cribbed from our columns, it would require some study to find anything funny in the whole grist. But in a land where they grow merry over the dismal jokes of *Punch* such stuff may cause a laugh.

QUESTIONS AND ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common-sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.

(211) D. W., New York, asks: 1. What should be the size of condenser for an engine of 100 horse-power? *A.*—There is no rule for size of jet condenser. In practice they are made all the way from one-eighth up to the full capacity of steam cylinder. 2. How much water will be required to condense the steam from such an engine? *A.*—That will depend upon how much steam the engine uses. Probably not less than 75 gallons per horse-power per hour.

(212) A. R., ——, asks: 1. Can I get pieces of steel of circular and U section magnetized? *A.*—Yes. 2. What is the horse-power of an engine 12"x8", running 250 revolutions? *A.*—That will depend entirely upon the construction of the engine, the way it is piped, the boiler pressure, and the point of cut-off. 3. How can brass be hardened after it has been annealed? *A.*—Friction, as by rolling, will harden it. 4. Can you give me a cause for a clattering and rattling noise in the steam chest of an engine after shutting off steam? *A.*—Very probably it is caused by the valve moving away from and to its seat. 5. Is a member or junior member of the American Society of Mechanical Engineers entitled to place M. E. after his name? *A.*—Yes, as much as anyone.

(213) A. H., Chicago, Ill., asks: 1. Are the canals the property of the State, or are they owned by companies; and how can I get information about them? *A.*—Some are owned by different States; others by companies. By addressing a letter to the Secretary of State, at the capital, you can find out about the State canals; or by addressing the companies you can learn about their canals. 2. Is there any reward offered for a propeller for use on canals that will not wash and destroy the banks? *A.*—We do not know that there is any at present. The State of New York offered a reward at one time, but the general impression from the trials was that washing the banks was a good deal of a myth. 3 Is there any chance to get support, either from the Government or from private parties, in carrying out experiments with a propeller for use on canals? *A.*—We should say there was no chance to get assistance from the Government; the only way to get assistance from private parties is to show them your invention. If they think there is a chance to make money from it, they will take hold of it.

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Katzenstein metallic packing, 169 Christopher st, NY.

Curtis Pressure Regulator and St'm Trap, July 4, p 15

Edw. Sears, wood engraver, 48 Beekman, St., N.Y

Presses & Dies, Ferracute Mach. Co., Bridgeton, N. J.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass.

The Best Upright Hammers run by belt are made by W. P. Duncan & Co., Bellefonte, Pa.

Consulting Engineer and Mechanical expert, C. C. Hill, 84 Market street, Chicago, Ill.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

The latest Improved Tack and Match Machinery is made by White Machine Co., Waterbury, Conn.

"How to Keep Boilers Clean." A book mailed free, by James E. Hotchkiss, 86 John street, N. Y.

Tools for amateur and foot-power lathes. Send for illustrations. Hartford Tool Co., Hartford, Ct.

Light fine interchangeable mach'y to order. Foot lathe catalogue for stamp. E. O. Chase, Newark, N.J.

Lyman's Gear Chart. How to lay out gear teeth. Price 50 cents. E. Lyman, C. E., New Haven, Conn

Foot Power Machinery, for workshop use, sent on trial if desired. W.F. & John Barnes, Rockford, Ill.

Pattern and Brand Letters. Vanderburgh, Wells & Co., corner Fulton and Dutch streets, New York.

Largest and best Portable Forge on the market, $10.00 each. American Tool Co., Cleveland, Ohio.

Improved Labor-Saving Upright Drills, B. G. & S. F.; prices reasonable. Currier & Snyder, Worcester, Mass.

Engine Lathes, Hand Lathes, and other fine tools. Assortment large; prices low. Frasse & Co., 62 Chatham St., N. Y.

Farley's Reference Directory of the Machinists, Iron, Steel, and Metal-Working trades of the United States. A. C. Farley & Co., Philadelphia, Pa.

The outline ("wax process") engravings shown in the AM. MACHINIST each week are made by Struthers, Servoss & Co., 32 Frankfort Street, N. Y.

Files recut without drawing temper, about one-half usual prices; samples recut free; prices on application. The Acme Co., Collinsville, Conn.

"Complete Practical Machinist," $2.50; "Mechanical Drawing Self-Taught," $4. Books for workmen. Joshua Rose, Box 3306, New York City.

Morrison's Practical Engineer, a complete treatise on steam and general machinery. Price, $1; mailed free. Indicators, Engineers' Instruments and outfits. W. A. Morrison, Box 373, Lowell, Mass.

Locomotive Engine Running and Management. By Angus Sinclair. Price $2, An excellent book for men interested in steam engineering, valve setting, designing valve motion, the care of the Westinghouse brake, etc. Published by John Wiley & Sons, 15 Astor Place, N. Y.

Every young man who aspires to be either a mechanic, merchant, or manufacturer, owes it to himself that he become thoroughly familiar with the writings of Chordal. John Wiley & Sons, 15 Astor Place, N. Y., have issued a new and enlarged 12 mo. edition of "Extracts from Chordal's Letters." Handsomely bound in cloth, with over 50 illustrations. Price, $2. Discount of 25 per cent. on orders for five or more copies.

MANUFACTURES.

A cotton factory is talked of at Holly Springs, Miss.

John Campbell, Fulton, N. Y., will erect an iron foundry.

Bromley Bros., Philadelphia, Pa., are building an addition to their carpet mills.

T. B. Mullen is building a new foundry and machine shop at Lexington, Va.

Hinger & Son, New Brunswick, N. J., will erect a button factory to employ 125 men.

Marshall Bros., Pittsburgh, Pa., will erect a foundry in connection with their machine shop.

The Campbell Cotton Press Company, of Albany, Ga., will erect a factory at the above place.

The Ohio Car and Manufacturing Company intend to build a $200,000 foundry at Lima, Ohio.

The Swift Manufacturing Co., cotton manufacturers, Columbus, Ga., are erecting a building 72x40 feet.

The Sanford Carpet Works, of Amsterdam, N.Y., have raised the wages of their 2,000 employes ten per cent.

It is said that the J. I. Case Plow Works, of Racine, Wis., will soon resume work with a good force of men.

The Crescent Steel Works, Miller, Metcalf & Parkin, of Pittsburgh, Pa., will build an addition to their works.

The Grinnell Manufacturing Company, New Bedford, Mass., are building a three-story addition to their cotton mill.

John Smith, of Smith, Mitchel & Co., Catlettsburg, Ky., is reported as intending to erect a saw mill at that place.

S. P. Young, Dallas, Texas, has purchased a site on which to erect a large mill and elevator. Capacity, 200 barrels a day.

It is rumored that the shops of the Western North Carolina Railroad may be moved from Salisbury to Asheville, N. C.

Workmen are busy making the three-story addition to the building occupied by the Bay State Arms Co., Uxbridge, Mass.

The Oswego Falls Factory Co., of Oswego Falls, N. Y., will erect a four-story brick factory building covering a space of 375x90 feet.

James W. Scoville will erect a five-story stove factory at 94 Washington Street, Chicago. It will be 105x69 feet, and will cost $20,000.

Arthur F. Gaylord and M. H. Moseman will start a brass and bronze foundry at Chicopee, Mass. Mr Moseman will manage the business.

The Boot and Shoe Co-operative Association, of Detroit, Mich., has been incorporated to manufacture boots and shoes, with $50,000 capital.

Legro & Co. will remove their machine shops and foundry from Bolivar to Salamanca, N. Y., that place donating $1,000 to the firm for locating there

John B. Simpson, Jr., No. 12 W. 129th Street, will erect a five-story factory corner Lincoln Avenue and Southern Boulevard, N. Y. City. It will cost $30,000.

Miller & Durst, Newton Falls, Ohio, have, within the past three months, started a new shop for the manufacture of portable water well drilling rigs and tools.

The Murphy Chair Works, of Detroit, Mich., will soon commence work on a new brick building near the Detroit and Milwaukee Junction. Estimated cost, $40,000.

William Flesh, of Philadelphia, Pa., is in Birmingham, Ala, prospecting with a view to establishing a stove manufactory.—*Baltimore Manufacturers' Record.*

The Coleman Cotton Cleaner and Gin Co., capital $50,000, has been organized at Chattanooga, Tenn., by W. O. Coleman and others. Works will be erected next fall.

J. H. Adams, Warner, Mass., is negotiating with Chattanooga, Tenn., parties for a site for a factory to make all varieties of machinist's tools.—*Baltimore Manufacturers' Record.*

It is proposed to form a $300,000 company in Dallas, Texas, to enlarge the water supply and furnish power for factories, by building a large aqueduct and opening a 5-mile canal.

The Greenfield Tool Company, of Greenfield, Mass., are enlarging their building next to the railroad track. It will be, when completed, of brick, 35x190 feet, and two stories high.

Proctor & Gamble, of Cincinnati, will erect a $200,000 soap factory, and Emery Bros, of that city, will build an $80,000 candle factory, to take the place of the one recently burned.

A Chicago correspondent writes us that wages are kept up in that city, but only a part of the workmen are employed, and it is hard to get a job. "Men come here from all over, and on that account it is a poor city to either come to or work in. Eastern machinists find it especially hard to get a job and to hold it, as they are not used to Western work and ways."

A syndicate of Mercer County (Pa.) capitalists recently commissioned Hon. Earl A. Wheeler to visit England to confer with Alfred Davy, inventor and proprietor of the Davy process of steel manufacturing. Mr. Davy is now on his way to this country. Those interested say that it is probable there will be steel plants located at Sharon, Sharpsville and Middlesex.

The Valley Machine Company, of Easthampton, Mass., are building for the New Jersey Rubber Company, of New Brunswick, N. J., and for the Conn. River Lumber Company, of Mount Tom, Mass., large fire pumps, designed after the Acme boiler-feed steam pumps built by this company. These pumps are said to possess some superior points as a fire pump.

The Whitin Machine Works, Whitinsville, Mass., are taking advantage of the dull times by adding to their works 150 new lathes, six new fluters, four new planers, besides making general improvements. They now have in progress and nearly ready for shipment, 400 new looms, 60 new spinning frames, 200 new cards, all of the latest and improved patterns.—*Manufacturers' Gazette.*

The Leatheroid Manufacturing Company, Kennebunk, Maine, have given out the contract for erecting a building 100x50 feet, three stories high, opposite their paint shop. The new structure is to be used for the manufacture of various goods from leatheroid, and will be fitted with a water-wheel, boilers, steam engine and fire sprinkler. Its erection will be commenced immediately.—*Industrial Journal.*

The United States Torsion Balance and Scale Co., of Jersey City, N. J., has been incorporated to manufacture scales and balances. Capital stock, $500,000. Corporators—Alfred Springer, Cincinnati, O.; Robert H. Thurston, Hoboken, N. J.; John Scott, Wm. Kent, and Robert D. Kent, of Jersey City, N. J. It is the intention of the company to have torsion balance scales upon the market within a few weeks.

The Norton Emery-Wheel Co., of Worcester, Mass., has been incorporated to manufacture emery-wheels, emery-wheel machinery, and articles of like character. Capital stock, $20,000. Corporators—Milton P. Higgins, George I. Alden, Horace A. Young, and Frederick H. Daniels. The manufacture of solid emery-wheels has heretofore been conducted by F. B. Norton, in that city, and the manufacture of emery-wheel machinery in the Washburn machine shop, under the direction of Milton P. Higgins, supt.

On the principle that "the proof of the pudding is the eating thereof," the Harrison Boiler Works, of Philadelphia, think the merits of their steam generator are being well recognized. Within the last few weeks the following orders have been received for Harrison's boilers: Ponemah Mills, Taftville, Conn., 400 H.P., a second order after thirteen years' experience; Henry Bower, Chemical Works, Philadelphia, Pa, 200 H.P., fourth order, having used Harrison's Safety Boiler constantly since 1865—twenty years' experience; A. H. McNeal, Burlington, N. J, 150 H. P., fourth order after having thirteen years' experience with this form of boiler; Baker, Smith & Co., New York City, 100 H P, fourth order, for Bryn Mawr College, Pa.; Stewart Hartshorn, Newark, N. J., 65 H. P, second order; Mutual Gas Light Co., Savannah, Ga., 80 H. P.; Van Liew, Britton & Co., Flemington, N. J., 74 H. P.; J. N. Plaster & Co., Enochville, N. C, 40 H. P.; Tucker & Amick, Princeton, Mo., 25 H. P.

A dispatch from Youngstown (O.) reads as follows: "J. J. Vinton, foreman of the foundry department of Brown, Bonnell & Co, has been quietly engaged for the past three years in experimenting upon the conversion of old steel rails. In that time he has melted nearly 300 tons of Bessemer steel, and finally has demonstrated that old rails can be run into edge tools, etc, by the cupola process, with one heating. A company will be organized here at once to utilize, under the supervision of Mr. Vinton, the discoveries he has made." As Robert E. Masters gave the process of melting old Bessemer rails in the common cupola and running into steel castings, in an article in the AMERICAN MACHINIST two or three months ago, it will be seen that Mr. Vinton is rather late about organizing a company to apply his discovery. Mr. Masters described the process so as to make it public property. Among those who have made use of the information he freely published is a foundry owner in Youngstown, who mentioned to us not long since that he was utilizing the process.

The Torrington Manufacturing Company, of Torrington, Conn., recently incorporated with $25,000 capital, will start a manufactory of Bishop's upholstery nail—a steel nail with a brass head.

E. G. Burnham, of the Eaton, Cole & Burnham Co., Joel Farist, President of the Farist Steel Co., of Bridgeport, Conn, and others, have formed a company for the purpose of manufacturing deoxydized bronze. Capital, $20,000.

The Standard Steel Casting, Co., Thurlow, Pa., poured successfully, on June 19, what they believe to be the largest steel casting ever attempted in this countrg, being an hydraulic cylinder weighing 22,000 pounds, for the Edgemoor Iron Co.

Chess, Cook & Co.'s projected plant at Braddock, near Pittsburgh, Pa., will consist of a mill for rolling steel plate for nails and tacks. For the present they will purchase the steel slabs; but next season they may decide to erect converters and make the steel themselves.

The Woodbury Engine Co, formerly Woodbury Booth & Pryor, Rochester, N. Y, have built thousands of boilers, and have never heard of the explosion of one of them. They believe that most boiler explosions could have been prevented by good materials and good construction.

Machinists' Supplies and Iron.

NEW YORK, July 2, 1885.

There is nothing new to note in the general supply or manufacturing business. In supplies there is a comparatively steady volume of business, which, while by no means satisfactory to dealers, is generally accepted as evidence that business in their lines is not likely to materially change, except for the better. But July is not a good month in which to expect improvement in business, and dealers and manufacturers will be well satisfied with holding their own at present.

Iron—In American Pig steady prices are maintained for standard brands; for other brands, irregular prices are the rule. We quote No. 1 Foun. dry $18; No. 2 Foundry $17, for favorite brands; other brands have sold for $17.50 and $16 50 respectively; Grey Forge, at furnace, $14 to $15, with decreased demand.

Scotch Pig has ruled dull. Only small lots are sold at prices favoring buyers. We quote Shotts, $20 to $20.50; Coltness, $20 to $20.50; Gartsherrie, $20; Summerlee, $20; Carnbroe, $18.50 to $19; Eglinton, $17.50 to $18; Langloan, $20 to $20 50; Dalmellington, $18.50 to $19.

Copper has been in very moderate demand, with hardly business enough to establish prices. Lake is held at 11⅛c.; other brands 10¼c. to 10⅝c.

Lead is held at 3.90c., but consumers are not disposed to pay this price, and the increase may be abandoned at any time.

Spelter—Refined, 8c. to 8¾c.

Tin—Banca, 21½c.; Straits and Malacca, 21⅛c. to 21⅝c.

Antimony—Hallett's, 9c.; Cookson's, 9½c.

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"Situation and Help" Advertisements, 30 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Wanted—Situation as foreman or superintendent of machine shop. Lock Box 568, Philadelphia, Pa.

Wanted—A position as foundry foreman; practical experience; not averse to contract. Address D., AM. MACHINIST.

Mechanical engineer and draftsman, lately engaged at erection of sugar refinery, wants responsible position by Aug. 1. Ability, AM. MACHINIST.

Wanted—Situation as superintendent of machine shop; good draftsman and designer; qualified for a position needing the above, separately or together. Address Mohawk, AM. MACHINIST.

Foreman wanted for an establishment manufacturing childrens' wagons and sleighs, also cabinet work; must understand wood-working machinery. Address, with references, P O. Box 1233, Montreal, Canada, stating wages expected.

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✡ MISCELLANEOUS WANTS ✡

Advertisements will be inserted under this head at 35 cents per line, each insertion.

3x4 yacht engine castings. Send stamp for price-list. J. L. Lucas, Waterbury, Conn.

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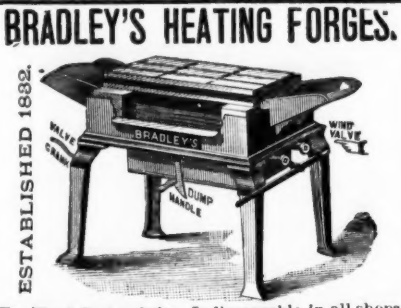

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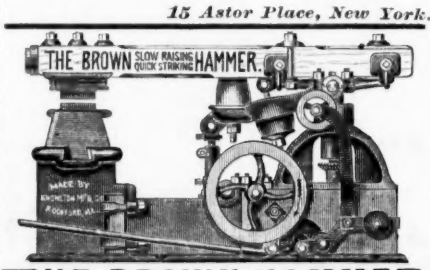

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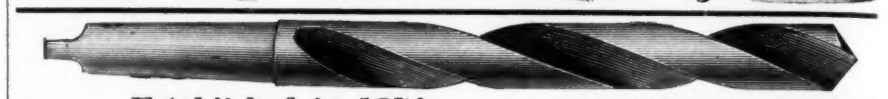

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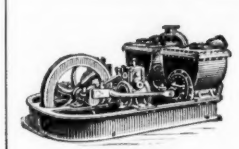

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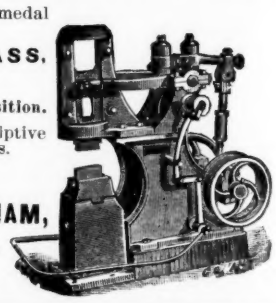

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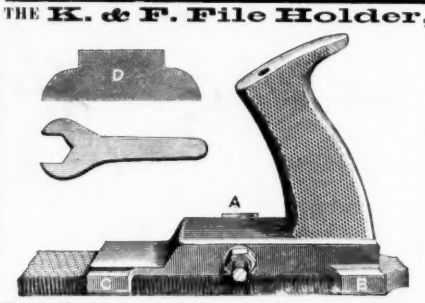

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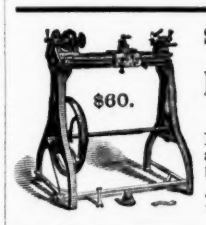

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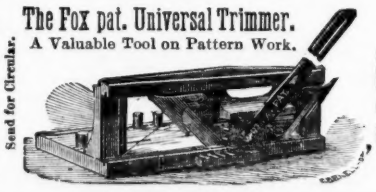

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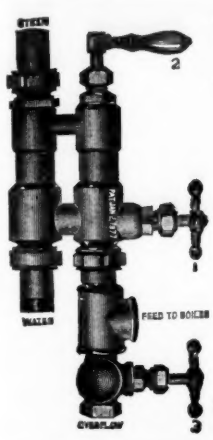

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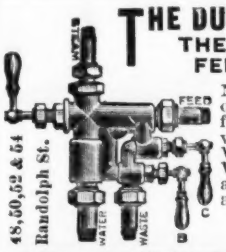

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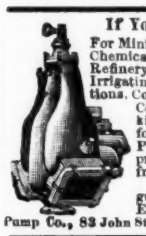

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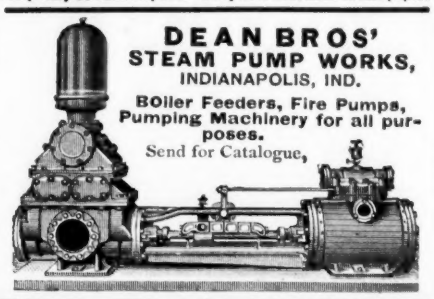

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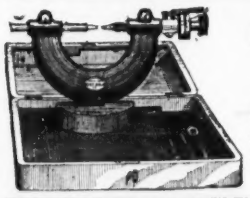

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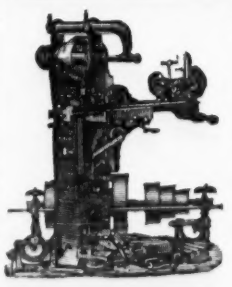

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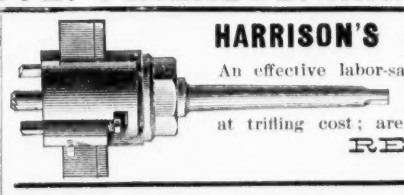

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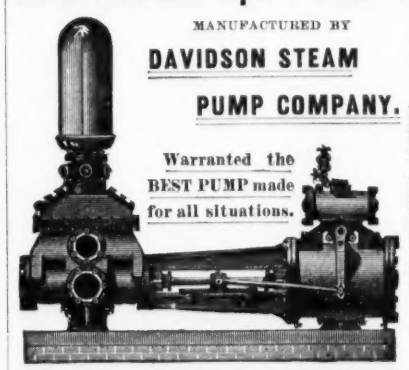

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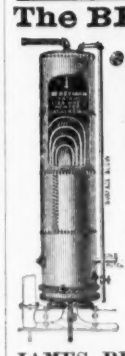

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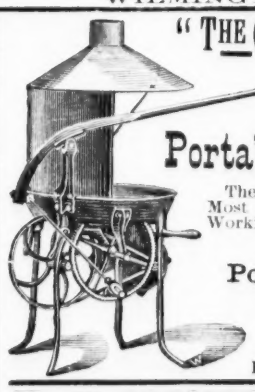

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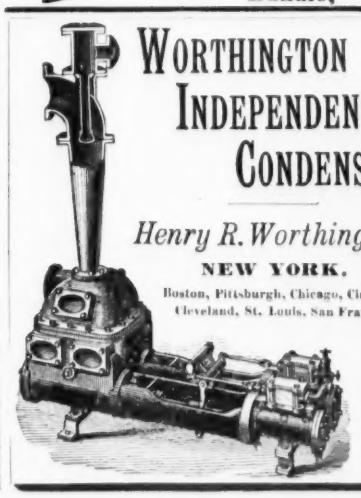

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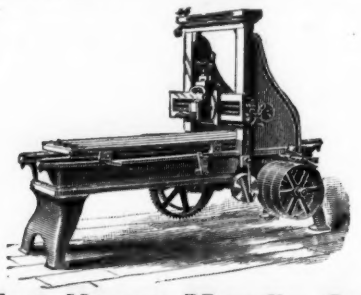

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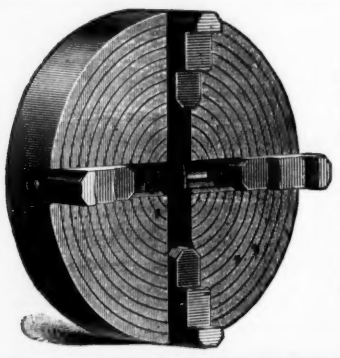

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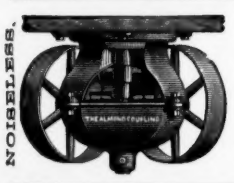

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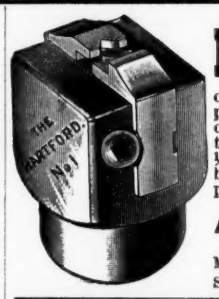

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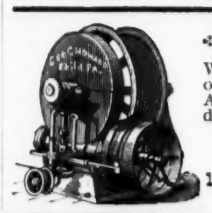

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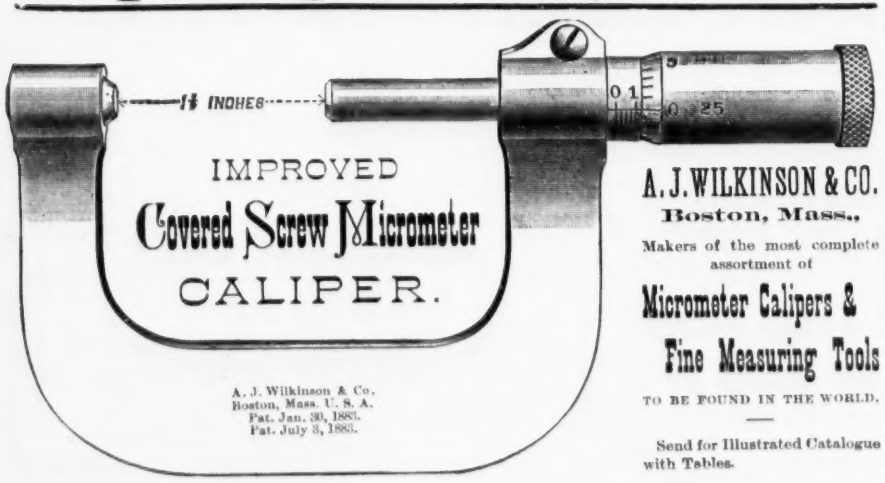

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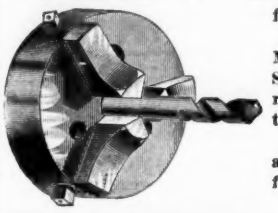

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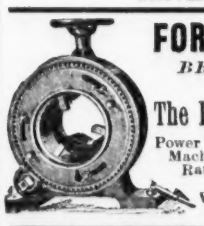

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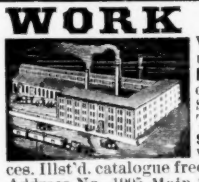

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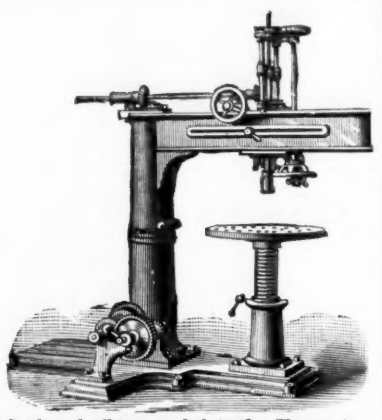

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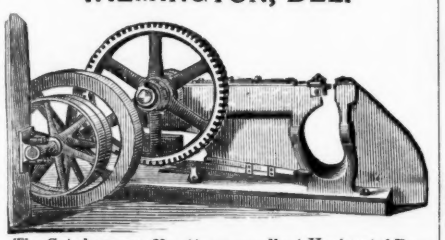

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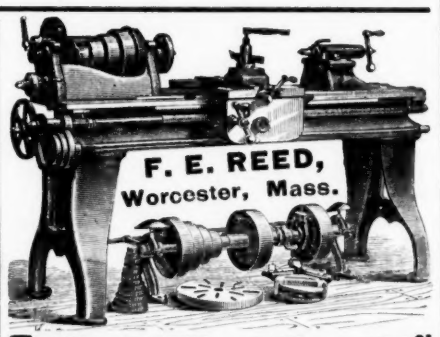

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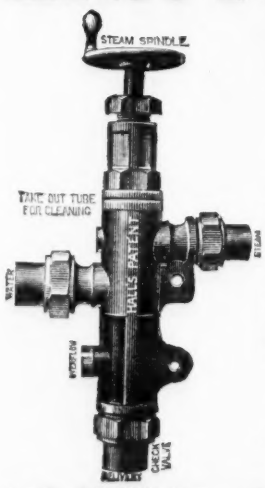

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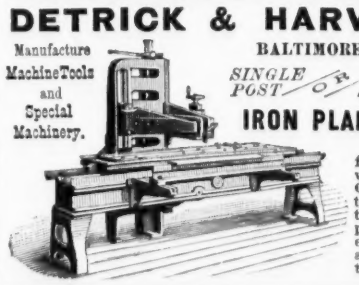

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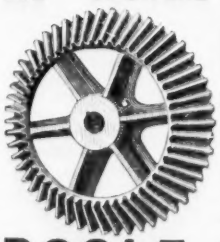

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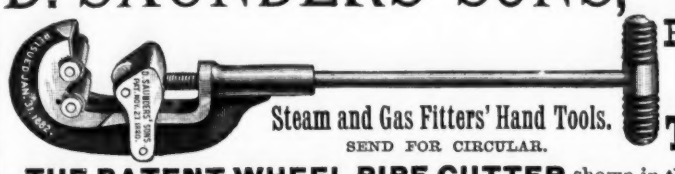

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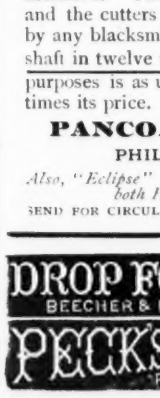

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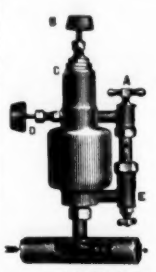

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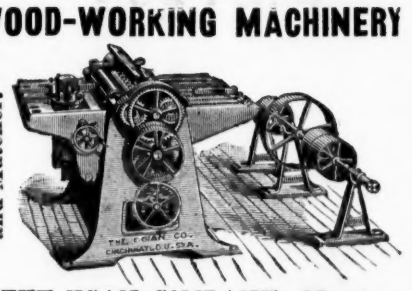

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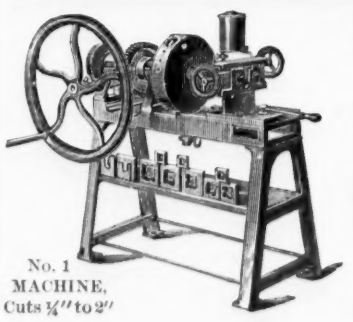

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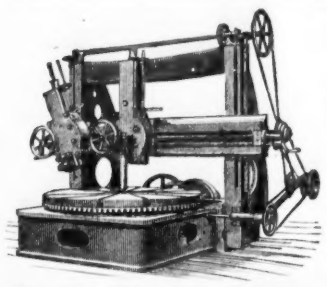

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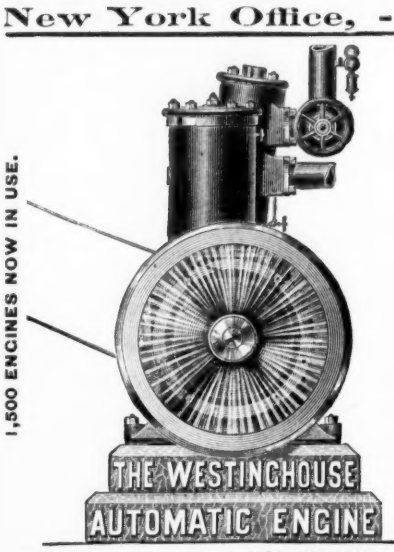

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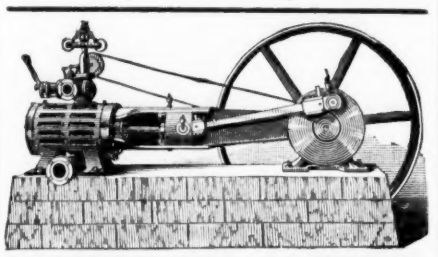

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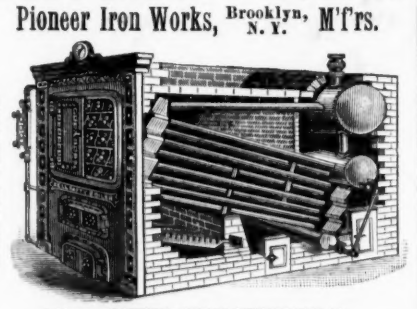

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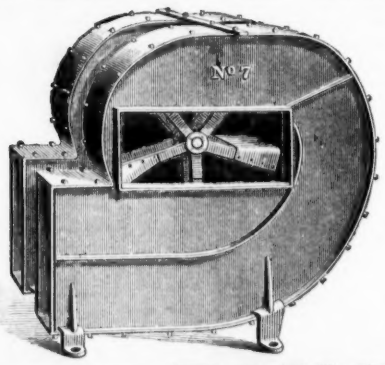

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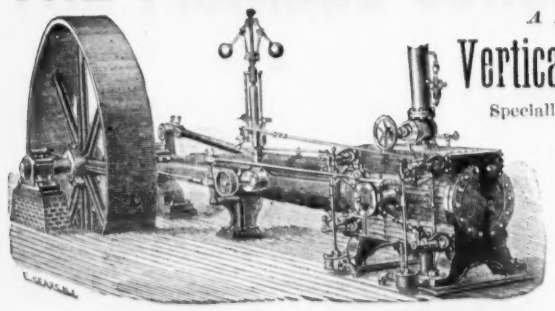

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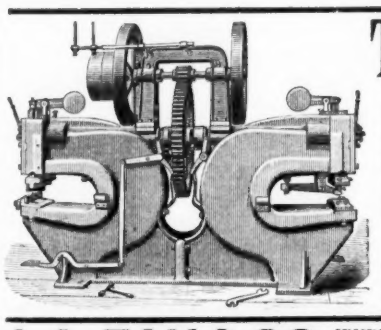

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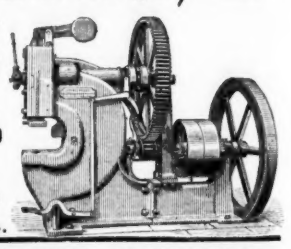

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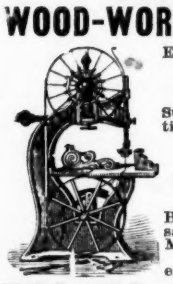

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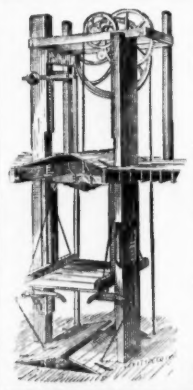

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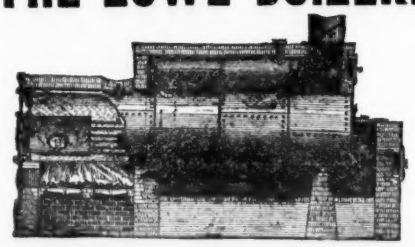

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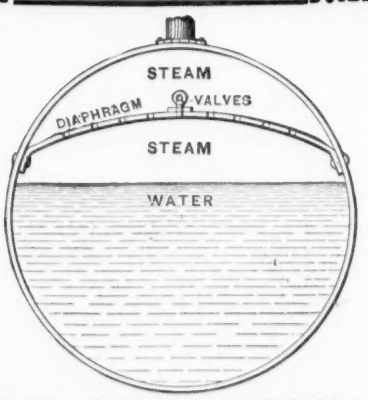

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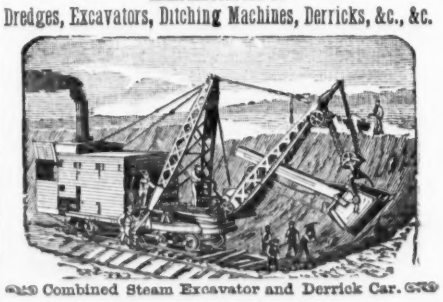

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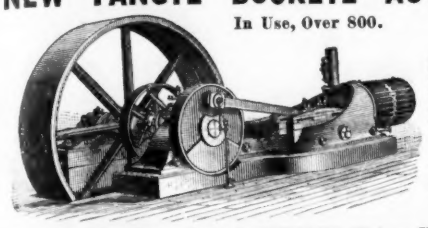

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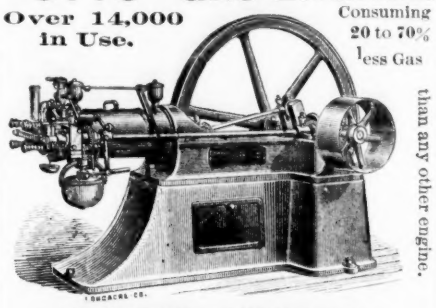

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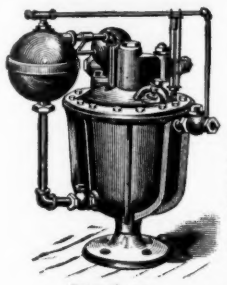

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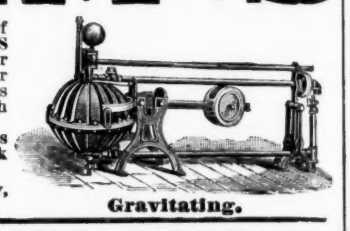

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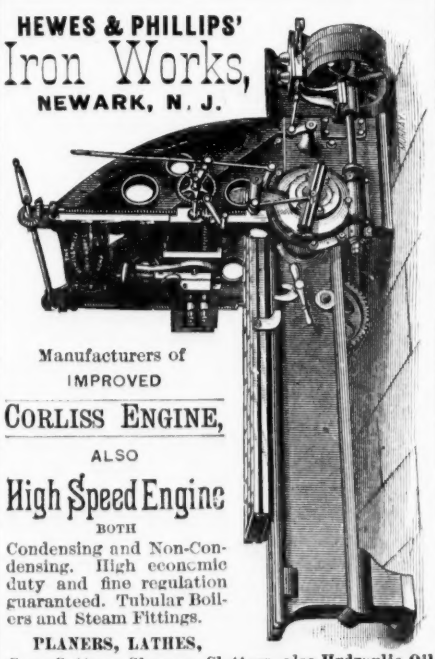

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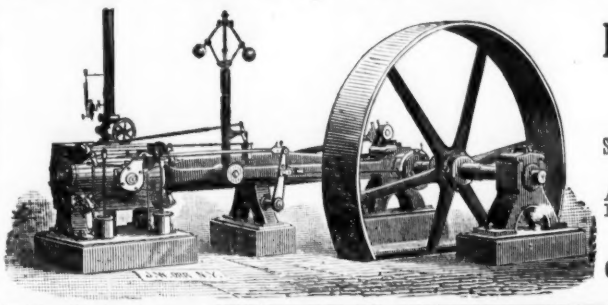

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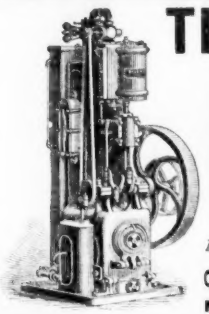

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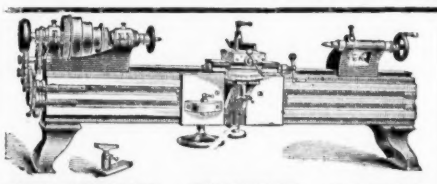

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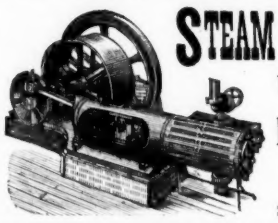

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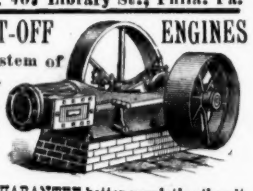

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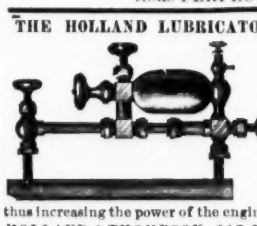

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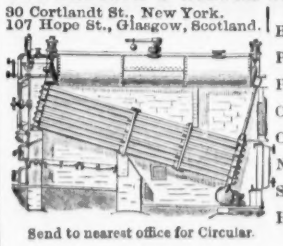

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Two Engine Lathes, 87 in. swing, 20ft. bed. Comp'd rest. Screw feed geared in face plate on each.
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Important Improvement
IN
Graduated SCALES.

The undersigned have the pleasure of informing mechanics, and others interested in fine measurements, that they have made an improvement in the graduation of their rules, by which measurements can be readily made and dividers set by thousandths of an inch. The improvement consists in making in a scale of hundredths, (perfectly near the end,) nine spaces of eleven-thousandths (11-1000) of an inch each and a diagonal line of points or dots, the point nearest the edge of the rule being twelve thousandths from the last line, the second point thirteen-thousandths, and so on, each point being one-thousandth of an inch further from the line than the point preceding it.

By the addition of the nine (11-1000) spaces, measurements can be made and dividers set by thousandths of an inch, from one-tenth of an inch to any length on the scale of hundredths; and with the addition of the nine (11-1000) spaces and line of points, dividers can be set by thousandths, from one-hundredth of an inch to any part of the scale.

EXAMPLES: To set dividers thirteen-thousandths of an inch, place one point of the dividers in the second dot and the other point in the last line. To get 75-1000, take two hundredths and five of the (11-1000) spaces. To get one inch and one thousandth, take ninety-nine hundredths and one of the (11-1000) spaces. To get 575-1000, take fifty-two hundredths and five of the (11-1000) spaces.

Believing this device to be of great convenience, and much needed in the present advanced state of the mechanic arts, we have added it to all lengths of our scales without additional charge.

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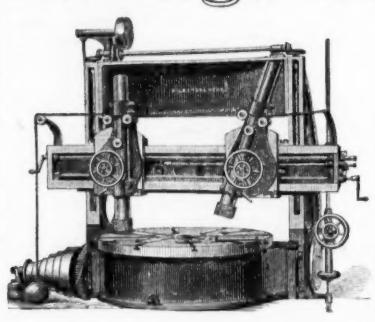

5, 6, 7, 8, 10, 12, 14 and 16 FT. SWING.

NEW MACHINE,

14–20 ft. Boring and Turning Mill. Housings and upper works arranged to slide back to take in work 20 ft. diameter. Has independent boring and key seating attachment.

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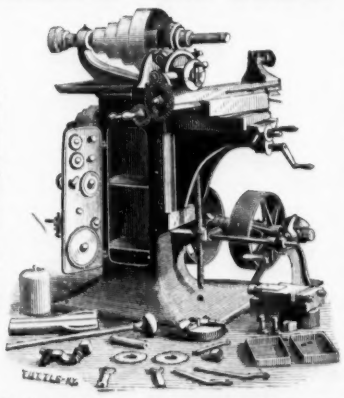

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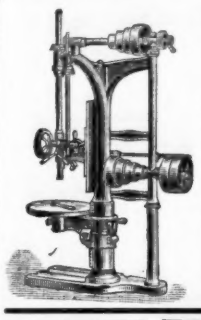

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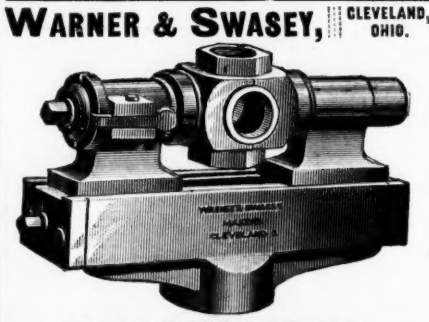

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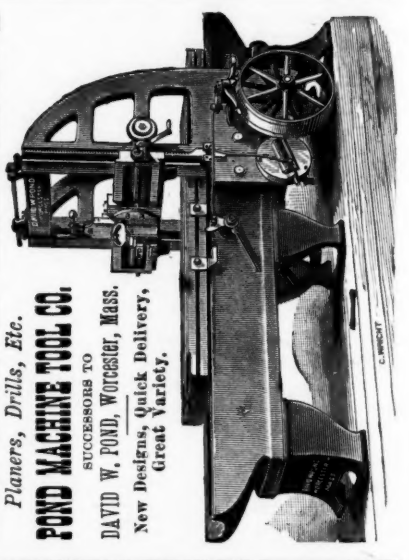

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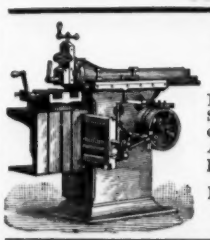

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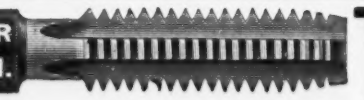

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